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ARCHIVES OF OTOLARYNGOLOGY

VOLUME 11 FEBRUARY, 1930 NUMBER 2

MIXED TUMORS IN THE SOFT PALATE

REPORTS OF TWO CASES AND A SURVEY OF THE RECENT LITERATURE *

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CHICAGO

The so-called "mixed" tumors which occur frequently in the cephalic region have given rise to a good deal of controversy because of the uncertainty regarding their origin. While they may occur in the neck, pharynx, lips, cheek and palate, they are found especially in the salivary glands, and are often generalized under the name of the salivary gland type of mixed tumors. These tumors are characterized by the heterogeneity of the tissues contained in them as well as by a great irregularity in the arrangement of the cells.

Heineke [1] of Leipzig, in 1913, was one of the first to make a detailed study of these tumors, including their histology. Of the 360 cases of mixed tumors of the salivary glands which he found recorded in the literature, 288 were in the parotid region, 69 in the submaxillary region and only 3 in the sublingual gland. Although Heineke referred to mixed tumors occurring elsewhere in the orofacial region he did not include them in his statistics, as his monograph referred only to tumors of the salivary gland. McFarland,[2] in a fine and comprehensive article, brought the subject down to date in 1926, and added to the existing statistics 90 new cases of tumors of the parotid gland (of which 67 were undoubtedly, and 12 cases probably, mixed tumors). Fry [3] recently published the results of a splendid study of 25 mixed tumors of the salivary gland observed in St. Mary's Hospital, London, England, from 1912 to 1923 inclusive. In this report he entered extensively into the histology of these growths, 17 of which were in the parotid gland and 5 in the submaxillary; the exact location of the other 3 was unknown.

Most writers agree that such tumors appear with about the same degree of frequency in males and in females, and that they may occur

* Submitted for publication, Aug. 12, 1929.

* Read before the American Laryngological Association, Atlantic City, N. J., May 21, 1929.

1. Heineke, H.: Die Geschwuelste der Speicheldrusen, Ergebn. d. Chir. u. Orthop. **6**:254, 1913.

2. McFarland, J.: Ninety Tumors of the Parotid Region, Am. J. M. Sc. **172**:804, 1926.

3. Fry, R. M.: The Structure and Origin of the Mixed Tumors of the Salivary Glands, Brit. J. Surg. **15**:291, 1927.

at any age. According to McFarland, they have been observed in persons varying in age from 1 to 87 years. Chamberlin [4] said that they occur most frequently between the twentieth and fortieth year, that they seem to have a preference for the left side, and that they are almost always sessile tumors.

The most important clinical fact connected with these mixed tumors is their long duration and slow development. As a general rule, they exist for many years before the patient consults a physician regarding them. Cases have been reported in which they have been known to exist for thirty, forty, fifty or more years before their growth has become sufficiently accelerated to cause serious trouble to the patient.

The largest mixed tumor of the parotid gland on record appears to have been reported by Conterill [5] in 1907; it was more than twice the size of the patient's head, weighing 26 pounds (11.8 Kg.). Operation was not performed. The largest parotid tumor for which operation was performed weighed 7 pounds (3.1 Kg.). Several illustrations of extraordinary mixed tumors of the salivary gland are given in Heineke's monograph.[1]

It will be seen from the foregoing comment that there is plenty of both clinical and histologic material available for the study of these tumors.

In this paper I am particularly interested in two mixed tumors of the salivary gland type occurring in the soft palate. Mixed tumors in this particular site are comparatively rare. In an excellent paper recently published, Eggers [6] stated that a careful search of the literature showed reports of more than 100 mixed tumors occurring in either the hard or the soft palate. Sturgis,[7] in 1914, recorded a personal case of mixed tumor in the soft palate and collected thirteen other cases reported by McLeod, Cross and Moche, Mauclaire and Durrieux, Sobileau, Cabourd, Berger, Heron, Swyngdeaux, Escat, Guggenheim and Ripault, and Halstead. Some of these cases are omitted from Eggers' list, but he says that the histologic details were absent in some cases, and that he was unable to consult the original reports in some others. About one third of Eggers' 100 cases refer to the soft palate. In the recent literature I find cases apparently not included in Eggers' list, such as those reported by Fry,[3] Chamberlin,[4] Moreau,[8]

4. Chamberlin, W. B.: Mixed Tumors of the Salivary Gland Type Occurring in the Soft Palate, Tr. Am. Laryng., Rhin. & Otol. Soc., Sec. **33**:175, 1927.

5. Conterill: Scott. M. & S. J. **20**:526, 1907, cited by McFarland (footnote 2).

6. Eggers, H. E.: Mixed Tumors of the Palate, Arch. Path. **6**:378 (Sept.) 1928.

7. Sturgis, M. G.: Mixed Cell Tumors of the Soft Palate, Surg. Gynec. Obst. **18**:456, 1914.

8. Moreau, L.: Sur une volumineuse tumeur mixte volo-palatine, Lyon chir. **17**:721, 1920.

Koch,[9] Davis [10] and Boyko.[11] Altogether the number of mixed tumors of the soft palate reported in the literature would appear to be under 50.

Chamberlin's case was that of a woman, aged 42. The tumor was in the left anterior pillar and consisted of two masses, 2 by 3 by 5 cm. and 1 by 1.5 by 2 cm., respectively, enclosed in a capsule from which they were easily shelled out. The pathologist reported a "mixed tumor of the salivary gland type." In Moreau's case the patient was a man, aged 22. The tumor was stated to have contained no epithelial elements, and was histologically described as a lymphendothelioma or a lymphatic perithelioma, according to the German pathologists. The author classified it as a (peri-amygdal) mixed tumor of the soft palate.

Koch's tumor occurred in a man, aged 57; it was of about forty years' duration, was on the left side and was the size of an apple. Boyko's case was in a woman, aged 32, and was located on the right side. In Davis' case, a large mixed tumor of the parotid gland was enucleated from the soft palate.

The palatal tumors do not differ essentially from mixed tumors of the parotid or other salivary glands, and what is known concerning the origin and structure of the latter may be presumed to be generally true of the former tumors.

REPORT OF CASES

CASE 1.—A. R., aged 29, first seen by me on Nov. 4, 1927, complained of having a "lump" in his throat and an external swelling on the right side of his neck. The latter had been present for three weeks, but the disturbance in his throat had existed for several years. The tonsils had been removed some time before. Examination of the nose and nasopharynx gave negative results, except that there was a large right inferior turbinate. Inspection of the pharynx revealed a huge, fairly firm, rounded swelling on the right side of the soft palate extending downward toward the tonsil fossa from which the tonsil had previously been removed. The larynx and trachea were normal. The Wassermann reaction obtained by the National Pathological Laboratory was negative. A roentgen examination made by Dr. Julius Brams showed no evidence of a pathologic condition in this region. The tumor was punctured with a large needle, but no fluid was found. The clinical diagnosis was fibroma of the soft palate. A few days later, under local anesthesia consisting of nerve blocking of the posterior palatine nerves and also infiltration of the mucosa covering the tumor by means of a 1 per cent solution of apothesine, the tumor was removed. An incision was made through the mucosa; then by blunt dissection the growth was removed in one mass. The tumor had a smooth capsule; it was nearly globular, with the exception of a few rounded protuberances, which gave the whole structure the appearance of a uterine fibroid. The dimensions were about 5 by 6 by 6

9. Koch, F.: Wien. klin. Wchnschr. **40**:780 (June 16) 1927.

10. Davis, D.: Large Mixed Tumor of the Parotid Enucleated from the Soft Palate, J. Laryng. & Otol., Soc. Proc. **40**:390, 1925.

11. Boyko, G. V.: Mixed Cell Tumor of the Palate, J. A. M. A. **85**:2023 (Dec. 26) 1925.

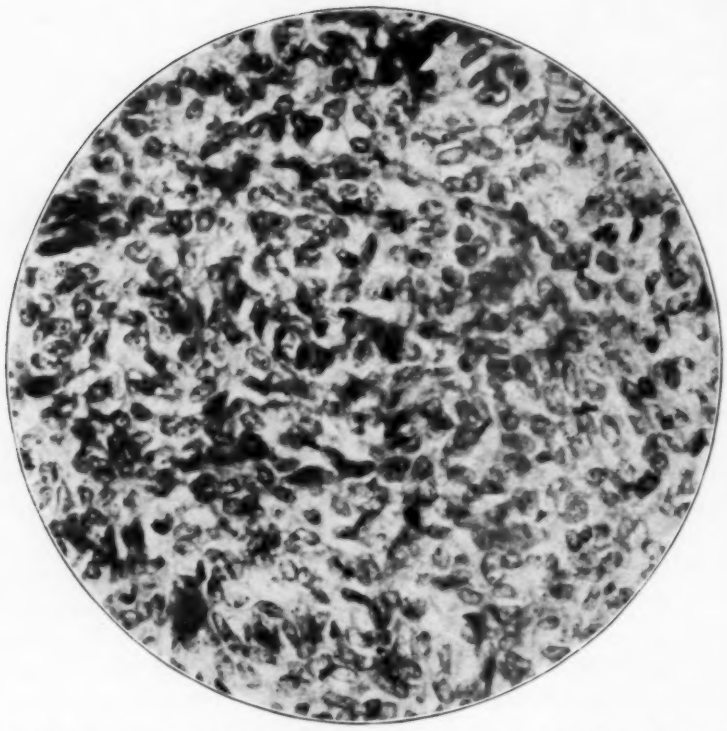

Fig. 1 (case 1).—Solid sheets of large pale-staining epithelial cells, with occasional mitotic figures.

Fig. 2 (case 1).—Irregular masses of small deep-staining epithelial cells, resembling nasal cell carcinoma.

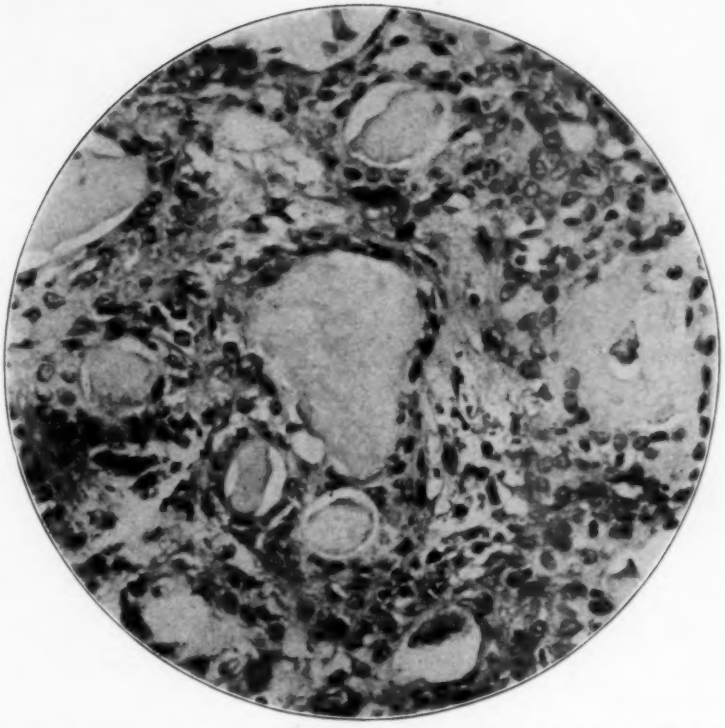

Fig. 3 (case 2).—Acini lined by flattened epithelium and having pink-staining homogeneous contents resembling colloid.

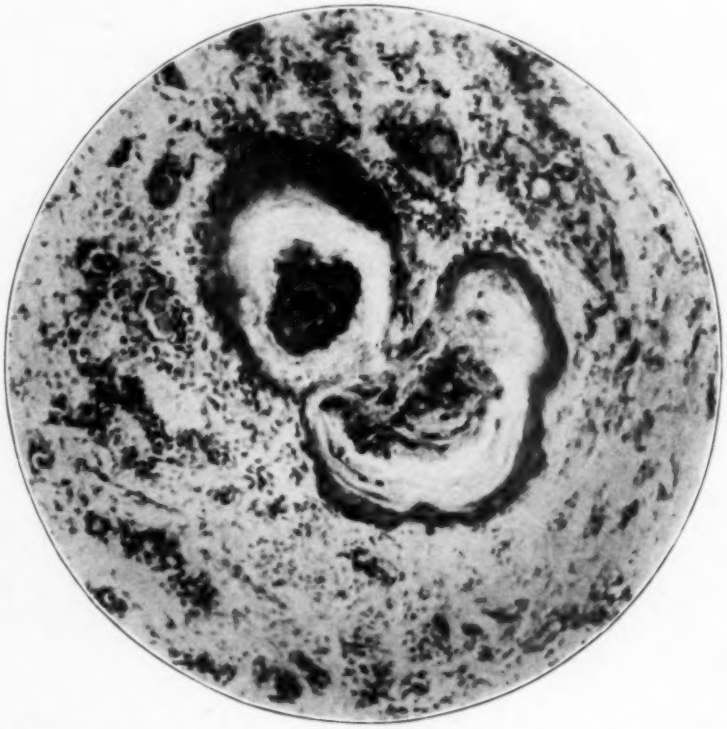

Fig. 4 (case 1).—Masses of squamous-celled epithelium with cornification and calcification.

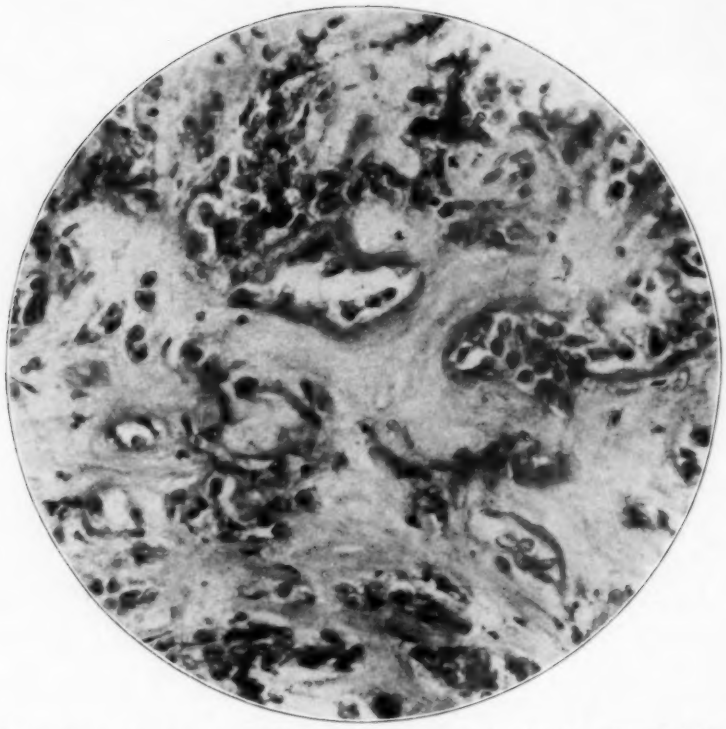

Fig. 5 (case 1).—Large epithelial cells arranged in alveoli, separated by wide bands of hyaline stroma.

Fig. 6 (case 1).—Areas of cartilage, mucoid stroma, basal cell type of epithelium and alveoli.

cm. The wound, closed with catgut sutures after the insertion of some gauze packing at the lower end of the incision, healed promptly. The tissue was fixed in a diluted solution of formaldehyde, U. S. P. (1:10). A histologic examination was made by Dr. Ludvig Hektoen and Dr. J. J. Moore of the National Pathological Laboratory.

In the microscopic sections were found various arrangements of epithelial cells in solid masses, alveolar formation, strands and columns separated by areas of

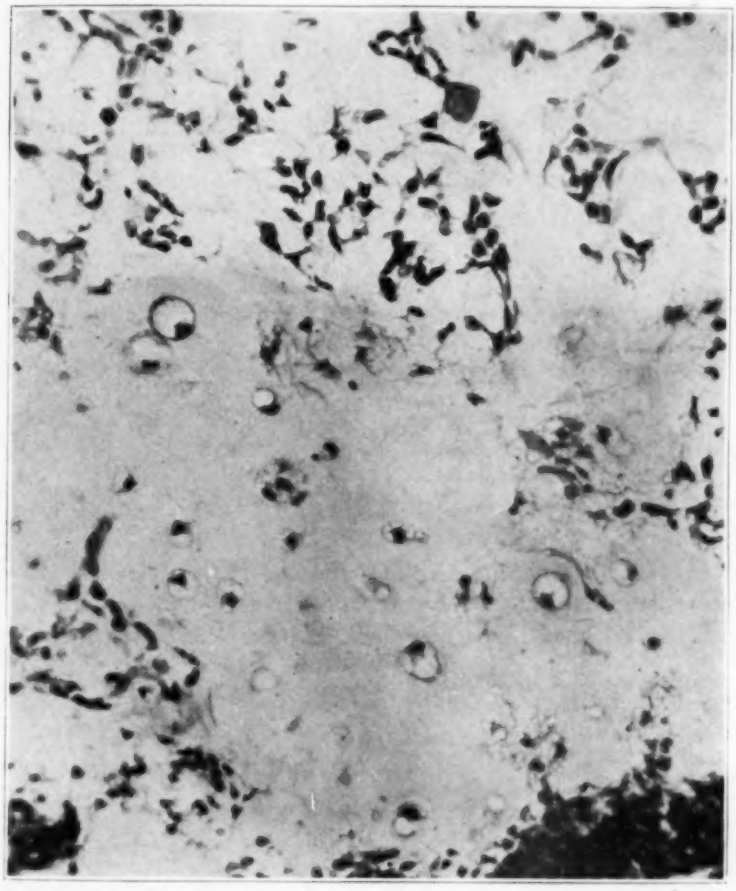

Fig. 7 (case 1).—Cartilage and mucoid tissue under higher magnification.

connective, mucoid and cartilaginous tissue. The epithelial tissue predominated in these slides. About one third of the sections consisted of sheets or large solid masses composed of large pale-staining epithelial cells with occasional mitotic figures (fig. 1). The next epithelial structures of importance were strands and columns of deep-staining epithelial cells resembling basal cell carcinoma invading mucoid (fig. 2) or hyaline stroma. A few alveoli were present, filled with a pink-staining substance resembling colloid lined by cuboidal and flattened epithelial cells (fig. 3). Squamous epithelial masses with cornification and calcification were infrequently found (fig. 4). The stroma consisted of con-

nective tissue, which in places was markedly hyaline, apparently compressing the epithelial strands (fig. 5) and mucoid (figs. 2 and 6) and cartilaginous areas (figs. 6 and 7). Fat cells were present in small groups but were not common. Blood vessels were not a prominent feature. They showed no relation to the epithelial cells. The growth was a mixed tumor of the salivary gland type and was classified as a myxochondrocarcinoma.

The patient was last observed about ten months after operation, at which time the pharynx, soft palate and pillars seemed normal except for the long scar. Recent attempts to get in contact with him failed because of change of residence.

CASE 2.—Dr. S. J. Pearlman, who performed the operation, has permitted me to report this case. Unfortunately the history is rather meager. It concerns a man, aged 29, who had no symptoms, although the growth had been present for several years. It was discovered accidentally on examination of the throat. The tumor was the size of an ordinary marble (about three fourths of an inch in diameter), and was situated in the right side of the soft palate. It was removed, together with its capsule, under local anesthesia. Nothing further could be learned of the patient.

A histologic examination was made by Dr. J. J. Moore. The section submitted for examination consisted chiefly of mesothelial elements including connective tissue, hyaline connective tissue and large areas of cartilage. In and between there were bands of large light-staining epithelial cells and many alveoli lined by cuboidal and flatter epithelial cells (fig. 3) and containing acidophilic-staining homogeneous material suggesting colloid. No collections of the small basal type of epithelial cell or of pearly formation were found. The histologic picture was that of a mixed tumor of the salivary gland type, which fell within the myxochondrocarcinoma group.

TISSUES IN MIXED TUMORS

According to McFarland,[2] the following tissues may be found in mixed tumors of the salivary glands of the neck (since they are of the same nature, all such tissues may occur in mixed tumors of the palate):

Connective tissues
- Cartilage of varying type
- Mucous tissue of varying type
- Fibrillar connective tissue
- Bone (rare)
- Adipose tissue (very rare)
- Muscle tissue (very rare)
- Lymphoid tissue (very rare)

Epithelial tissues
- Glandular epithelium, almost always
- Squamous epithelium, in the majority of cases.

Several or possibly all of these tissues may be found in every mixed tumor of the kind under discussion. In the first case which I report in this paper, a number of these tissues occurred. It is perhaps this heterogeneous collection of tissues which has aroused the great interest of histologists as well as of clinicians, and which is the basis for the fairly large literature which has sprung up regarding them.

Eggers analyzed 92 mixed tumors of the hard and soft palate on the basis of their containing some or all of the four tissues most often found in mixed tumors, in general; i. e., mucoid connective tissue, and cartilage, glandular and squamous epithelium. Twelve of the tumors showed the presence of all four tissues; in 70 there was mucoid tissue, in 35 cartilage, in 84 epithelial glandular tissue and in 32 squamous epithelial tissue. The great majority of the tumors showed the absence of one or more kinds of tissue. The other elements of less frequent occurrence (fatty tissue, muscle and bone) were not considered.

ORIGIN AND STRUCTURE OF MIXED TUMORS

When these growths were first examined microscopically, the German pathologists regarded them as connective tissue tumors. When epithelial tissue was observed, it was considered as arising from embryonic "rests" of the gland in which the tumor occurred. French pathologists generally regarded the tumors as of epithelial origin and as derived from the glandular tissue proper. Depending on the view adopted by them, other writers described the growths as endotheliomas, epitheliomas, sarcomas, etc. In order to gain some idea of the mode of occurrence of the various tissues in mixed tumors, one must consider the theories that have been advanced by different investigators with reference to their origin.

A summary of these views, as given by Fry, is as follows:

1. The endothelial theory (Volkmann's) held that the tumors were derived from the endothelium of the lymph vessels. This theory has been gradually discarded because mixed tumors of the salivary gland type do not in many respects conform to the characteristics of endotheliomas.

2. The embryonic theory was that the tumors are derived from pluripotential cells which have ceased to develop further at different stages of embryonal development, and which have later given rise to neoplasms.

3. The branchial theory was developed largely to explain the presence of cartilage.

4. The theory of origin from embryonic gland germs has never received great support. It is necessary to assume either that the "rests" consist of both ectodermal and mesodermal elements, or else that the connective tissue is derived by metaplasia from the epithelium.

5. On the theory of origin from fully formed glandular tissue (which Fry states is becoming more and more adopted), the tumors are supposed to be derived from adult gland cells. Fraser,[12] who dis-

12. Fraser, A.: Mixed Tumors of the Salivary Glands, Surg. Gynec. Obst. **27**:19, 1918.

cussed this question after comparing the growths with the effects of ligation of the parotid duct in dogs, came to the conclusion that the tumors arise entirely from the cells of the ducts, and that the cartilage is formed from the epithelial elements by metaplasia.

With reference to the microscopic aspects of the various tissues, Fry [3] gives a complete histologic account of a typical mixed tumor of the salivary gland in which he said that for descriptive purposes only two main types of tissues need to be considered, namely: (1) those parts of the tumor in which the cells are abundant, lying closely packed together, with the stroma scanty or nonexistent; and (2) those parts in which there is much stroma and the cellular elements are widely scattered, lying singly or in small groups.

Fry's detailed observations are as follows:

> (In the first type) where there is much parenchyma and little stroma, the cells (being tightly packed together) show very indefinite outlines. In most places they merge into one another, giving the appearance of a syncytium, but occasionally their outlines can be distinguished, and they are then generally polyhedral, cubical or low columnar. Their nuclei are almost invariably large, and round or oval, showing very distinct nuclear markings, and often a well-marked nucleolus. The cytoplasm shows no special characteristics.
>
> (In the second type) where there is an abundant stroma, the cells undergo great changes in appearance. The nuclei generally lose their regular shape and clear markings, and become irregular in shape, variable in size and stain uniformly deeply with hematoxylin. The cells themselves tend to become triangular or spindle-shaped and the cytoplasm appears to extend out from the corners of those irregular cells in fine processes which blend imperceptibly with the stroma.
>
> The stroma itself consists of two parts. Firstly, there is a network of fine fibrillar connective tissue running between the cells and groups of cells. This provides support for the cells, and also carries the very limited number of vessels which supply the tumor. These vessels, few in number, are generally very thin-walled, often consisting of merely an endothelial lining. They are present in small quantities in the more cellular parts of the tumor, but are often practically absent from the less cellular parts. In these parts the connective tissue stroma is practically nonexistent too, and it is here that the second element of the stroma comes into prominence—a substance closely resembling mucin. Whether it is pure mucin is difficult to say, but microscopically it is indistinguishable from mucin and stains well, often intensely, with mucicarmine. This substance varies in its appearance, in places having a definite fibrillar structure when it stains most intensely with mucicarmine and in other places being quite homogeneous in appearance not unlike the matrix of cartilage. In those parts the staining reaction is not so well marked. There are intermediate stages between these extremes and all forms may be present in the same tumor clearly representing different stages in a biochemical change which is taking place.
>
> This mucinous material should not strictly be regarded as stroma as in its origin and nature it is quite distinct from the stroma proper, but it is described as such purely for convenience in the account of these tumors.
>
> Finally, in these less cellular parts, especially where the mucinous stroma is homogeneous, the cells occasionally have a special relationship to the stroma lying apparently free inside small circular vacuoles, in the stroma. Round the periphery

of these vacuoles, there is usually some condensation of the mucinous material leading to a more deeply stained ring in the mucicarmine preparation, and the whole appearance is scarcely distinguishable from a section of cartilage stained by the same method.

The arrangement of the cells varies in different parts of the tumor, but Fry stated that these variations may be grouped under four headings:

1. Irregular masses of cells of varying size, in which the cells are closely applied to each other without any definite arrangement.

2. Cells in adenomatous arrangement. In these parts the cells show a definite tendency to imitate glandular forms, and occasionally nearly perfect reproductions of salivary ducts may be found.

3. Alveolar formation. In such places alveoli of varying sizes are found. Many of these may be formed by the dilatation of the ductlike structures mentioned. These alveoli are sometimes empty; sometimes they contain a homogeneous material which stains intensely with eosin or picric acid, and at other times they contain mucin.

4. Rarely a type of tissue is met with which at first sight appears to consist of interlacing double columns of cells which have split down the middle of the column. On examination of many sections, however, it is found that this appearance is produced by papilliferous ingrowths into dilated alveoli or by the irregular compression of alveoli.

On the basis of this study of twenty-five mixed tumors of the salivary gland type, Fry came to the conclusion that the tumor cells are derived from the secreting cells of the gland. In regard to the cartilage, he said that "it would appear that in the tumors of this series, cartilage does not exist. There is in many places a tissue closely resembling cartilage, but the cells in it are epithelial cells derived from the other epithelial cells of the tumor and the matrix is a degenerative product of the mucin which is formed by an exaggeration of the normal function of the epithelial cells." He stated further that the so-called mixed tumors of the salivary gland type are not really mixed, but are entirely epithelial in origin. The mucinous material, which is such a prominent feature of most of these tumors, is a true secretion of mucin by the tumor cells.

The view that the epithelial cells underwent a mucoid degeneration and subsequent chemical transformation into cartilage was first put forward by Erich [13] in 1906.

McFarland stated that if the mixed tumors are inclusions (enclavoma) and originate in sequestrated and isolated embryonal material, the varying miscellany of tissues explains itself through the number and

13. Erich, E.: Zur Konntniss der Speicheldrusentumoren, Beitr. z. klin. Chir. **51**:368, 1906.

character of the originally sequestrated materials. Antecedents of all the different tissues were found present in the rudiment or primordium from which the tumor grew.

Eggers, who made a close histologic study of five personally collected tumors of the mixed type occurring in the palate (in four of these the tumor was unquestionably typical) and also reviewed the literature of mixed tumors of the salivary gland type, came to the conclusion that the theory of embryonal displacement would account most satisfactorily for these tumors, if it were not for the fact that occasionally they show a gradual mergence into normal glandular structure, and that usually they show an intimate blending of parenchymatous epithelium and stroma to the point that it is not possible to determine where one ends and the other begins. To explain the apparent transition from epithelial to connective tissue there was advanced the theory of actual metaplasia of epithelium into mucoid connective tissue or cartilage. Many writers now believe that these mixed tumors occurring in the salivary glands may be derived by metaplastic processes involving the development of the neoplastic epithelium of the tumor. In the case of palatal tumors, according to Eggers, a similar process is postulated from the mucous glands of this region. In all five palatal mixed tumors investigated by Eggers there was an infiltrative growth of the epithelial elements, and in all except one there was an apparent merging of epithelium into stroma.

The mixed tumor of the palatal gland, according to Eggers, shows a somewhat lower incidence of cartilage and a higher incidence of squamous stratified epithelium than tumor of the salivary gland. This could be explained, if the theory of displacement is correct, as the later embryonic development of the palate. However, the clinical and histologic evidence is not decisive.

From the various opinions cited, it would appear that there is still doubt and disagreement regarding the exact origin of mixed tumors of the salivary gland type; but it seems that there is at least some tendency to accept the occurrence of the so-called cartilage as the result of a metaplastic process.

BENIGNANCY OR MALIGNANCY OF MIXED TUMORS

The question of the benignancy or the possible malignant degeneration of mixed tumors of the type described is of importance in connection with prognosis.

Wood,[14] in 1904, expressed the opinion that about 25 per cent of mixed tumors of the face and neck showed malignant degeneration.

14. Wood, F. C.: Mixed Tumors of the Salivary Glands, Ann. Surg. **39**:57, 1904.

Fry stated that some of these tumors show varying degrees of malignancy, but that there is no definite dividing line between the benign and the malignant tumors.

McFarland was more definite. He expressed the opinion that mixed tumors of the salivary gland type are inherently benign, an opinion that was also held by Heineke. They commonly recur, however, after excision (he found a 25 per cent recurrence in his own series), and if frequently disturbed, become locally destructive without showing metastases. He found only one fairly definite case of sarcomatous change in seventy-five supposedly mixed tumors. From his study he also concluded that there is little evidence, either in the clinical data or in the literature, to support the idea of the carcinomatous degeneration of mixed tumors, or that at least the occurrence is rare. According to McFarland's view, the rapid enlargement of a mixed tumor of long duration and slow growth is not the result of malignant change; an interval of ten, twenty or thirty years may elapse between the operative removal of a mixed tumor of this type and its recurrence. Nothing of a prognostic nature can be deduced from a microscopic study, but the structure and duration of the tumor must both be taken into account in the formulation of a prognosis.

Eggers said that in palatal tumors malignancy is of far rarer occurrence than in mixed tumors of the salivary glands. In only two of the ninety-two cases of this kind of tumor, the histories of which he examined, were there instances of invasive or recurrent growth. He further said that it is the general opinion that mixed tumors of the parotid gland become malignant only when they escape from their capsule. Palatal tumors, however, usually cause more discomfort than tumors of the salivary gland. Because of this fact, as well as of their being more readily recognized, they are more likely to receive surgical treatment early, and thus escape from any tendency to a malignant termination. "It must be emphasized, however, that from the morphologic point of view alone, practically all of the palatal tumors would be adjudged as malignant; from the clinical point of view, almost none."

Treatment in cases of mixed tumors is surgical removal except for those which are inoperable because of intimate relation to large blood vessels or for some other reason. When surgical intervention is contraindicated, roentgen treatment is said to be efficacious.

CONCLUSIONS

1. Mixed tumors involving the soft palate are rare.

2. Their exact origin is not definitely known, some authors believing that they are entirely epithelial and others that they are the result of "enclavement" or accidental sequestration of embryonal cells during the early and complicated development of the base of the neck.

3. These tumors are probably individual entities having no relation to the normal structures in which they occur and from which they do not arise.

5. While they are apparently benign, they often recur after removal; if frequently disturbed, they may become locally destructive even though they produce no metastases.

6. When histologically examined, they may show an apparently malignant character, although clinical history usually shows the contrary. In other words, the prognosis should be determined from the history of the case and not from the histologic observations.

180 North Michigan Avenue.

UNILATERAL ABSENCE OF SIGMOID SINUS*

HERMAN I. LAFF, M.D.
DENVER

The sigmoid portion of the transverse sinus, although varying in position and in size in different mastoid processes, is, to be sure, a constant observation in temporal bones. The complete absence of this sinus, as shown in the following case report, is of interest not only because of its rarity, but because it serves to bring up the question of the embryology of the venous blood channels in the cranial cavity.

REPORT OF CASE

While dissecting a "head and neck" in the First Anatomical Institute of Vienna, Dr. Milton Golfein and I came across the following anomaly:

The specimen was that of a man, aged 35, showing no apparent external deformity. After we had removed the brain and dura, our attention was directed to the disparity in size between the two petrous bones and the complete absence of a sigmoid sinus on the right side. Unfortunately, the dura had already been destroyed, and we were unable to trace the exact distribution of the sinuses between its layers.

On the left side the sulci for the sinuses showed a normal arrangement (fig. 1), except that the sulcus of the left sigmoid sinus was larger and more excavated than normally.

On the abnormal right side (fig. 2), there was a scarcely noticeable, shallow depression leading from the confluens sinuum, as the horizontal portion of the sinus transversus, but after extending for a distance of 7 cm., it curved rather abruptly downward and entered a large foramen for the mastoid emissary vein, just behind the mastoid process. When the emissarium was probed from its opening on the external surface of the temporal bone, behind the mastoid process, it was felt as a large channel extending downward and medially into its opening on the internal surface. Anterior to the emissarium opening on the inner surface, the continuation of the transverse sinus (sigmoid portion) was entirely lacking for a distance of 4.5 cm. The right jugular foramen was very narrow compared with its fellow of the opposite side. The right inferior petrosal sinus was well developed and was the only vessel emptying into the small right internal jugular vein, which measured only 2 mm. in diameter. A right jugular bulb was lacking. The groove for the right superior petrosal sinus was completely absent, the two surfaces of the petrous pyramid meeting at a sharp angle. Compared with the petrous bone of the opposite side, the right was unusually infantile and underdeveloped. Viewed from the posterior surface, the superior (frontal) and inferior (sagittal) semicircular canals were prominent, the opening for the aqueductus vestibuli was superficial, while the lateral half of this surface formed a large, deep excavation. Viewed through transmitted light, the transparency of this surface was readily seen.

* Submitted for publication, Aug. 13, 1929.

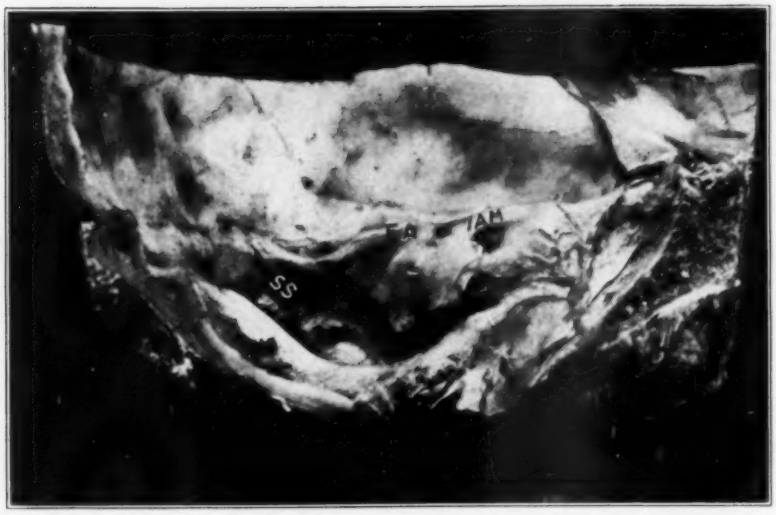

Fig. 1.—Left temporal bone, showing large sulcus for sigmoid sinus. *EA* indicates the eminentia arcuata; *IAM*, the internal auditory meatus, and *SS*, the sulcus for the sigmoid sinus.

Fig. 2.—Right temporal bone, showing complete absence of sulci for the sigmoid and superior petrosal sinuses. Note the infantile character of the petrous pyramid with a prominent arcuate eminence, a subarcuate fossa and a convexity for the sagittal semicircular canal as well as the superficial opening for the vestibular aqueduct. *AV* indicates the acqueductus vestibuli; *EA*, the eminentia arcuata; *IAM*, the internal auditory meatus; *MF*, the mastoid foramen; *SC*, the sagittal semicircular canal; *SF*, the subarcuate fossa. The portion from *X* to *X* shows the complete absence of a sulcus for the sigmoid sinus.

REVIEW OF THE LITERATURE

A perusal of the literature revealed the fact that otologists have scarcely been aware of the existence of temporal bones lacking sigmoid sinuses, although anatomists occasionally have found such specimens. Thus in the Museum of the Anatomical Institute of Vienna, Professor Hochstetter showed me one such specimen. Hofmann,[1] in 1924, reported a case of high-grade underdevelopment of the left sinus sigmoideus and internal jugular vein, and reviewed the literature. The specimen in his case, although resembling the specimen described, differed from the latter in that it still possessed narrow channels for the sigmoid and superior petrosal sinuses, and did not show any evidence of underdevelopment of the petrous bone.

Barkow,[2] quoted by Hofmann, reported a case in which there was a large right jugular foramen, a much smaller jugular foramen on the left and a sigmoid fossa on the left ending in an unusually large mastoid foramen, whereas for a stretch of 20.9 mm. between the mastoid foramen and the left jugular fossa, the sigmoid sinus was entirely lacking.

Zuckerkandl, Buhe, Tervarts, Henle, Rohrbach and Linser, as quoted by Hofmann, reported other anomalies in the course and situation of the transverse sinus.

Professor Alexander, on being shown the specimen described, offered his invaluable aid and interest in the matter. He also lent me three temporal bones from his collection for study, which were presented to him by Dr. Alexander Körösy of his clinic, and which showed another type of anomaly. A description of this type of abnormality will help to explain the factors involved in the development of the venous sinuses of the dura mater. Professor Hochstetter also showed me specimens and models portraying the embryonic state of the venous channels in the skulls of animals.

Two of the temporal bones referred to are a pair from the skull of a child, aged 1 year, and, together with a third from that of an adult, show the same type of anomaly, i. e., the persistence of the so-called sinus petrosquamosus. Commencing from the upper end of the sulcus sigmoideus, this emissary-like vessel communicated with the surface veins of the head by forming a deep groove in the temporal bone in the angle between the squamous and the petrous portions, leaving the skull through the so-called foramen jugulare spurium of Luschka, under the lower edge of the root of the zygomatic bone. The sigmoid sinus was present in these specimens (fig. 3).

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1. Hofmann, L.: Ein Fall von hochgradiger Unterentwicklung des linken Sinus sigmoideus und der Vena jugularis interna, Monatschr. f. Ohrenh. **59**:406, 1924.

2. Barkow: Anat. Abhandl., Breslau, 1858; cited by Hofmann.

To understand properly the origin of the anomalies mentioned, a study of the embryologic development of the venous blood channels inside the cranial cavity is essential. Salzer [3] studied the development of the blood vessels in the brain of different mammals, and Streeter,[4] in 1915, showed in a striking manner their mode of development in the human embryo; Markowski,[5] in 1922, further contributed to the latter study.

The arrangement of the primitive venous drainage of the brain consists of capillaries surrounding the brain tube and emptying into the anterior cardinal vein which enters the heart. These capillaries drain into three plexuses which have three stems—anterior, middle and posterior—which unite to form the "primary head vein" in the region of the midbrain. The primary head vein consists of an anterior portion medial to the gasserian ganglion and a posterior portion lateral to the otic vesicle and the seventh, eighth, ninth, tenth and eleventh cranial nerves.

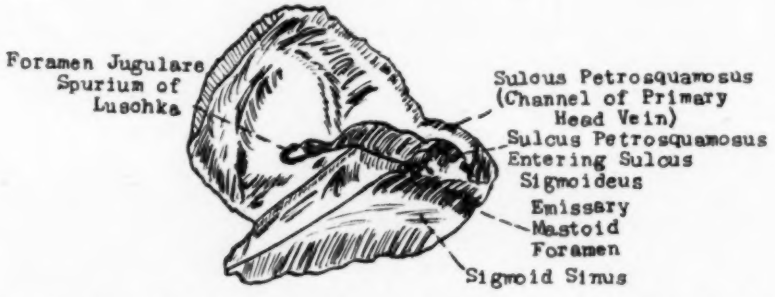
Foramen Jugulare Spurium of Luschka
Sulcus Petrosquamosus (Channel of Primary Head Vein)
Sulcus Petrosquamosus Entering Sulcus Sigmoideus
Emissary Mastoid Foramen
Sigmoid Sinus

Fig. 3.—Sketch of infant's temporal bone, showing decadent channel of primary head vein.

According to Hochstetter,[6] this vein in *Echidna* forms now the chief stream for the venous blood of the anterior division of the brain. It leaves the skull capsule in a bony canal not far from that for the facial nerve, and after leaving this canal unites with the anterior cardinal vein.

In all other mammals further changes arise whereby an anastomosis is formed above and medial to the otic vesicle, between the stems from the middle and posterior plexuses, so that now a part of the venous blood of the brain leaves the skull through the jugular foramen, and

3. Salzer, H.: Ueber die Entwicklung der Kopfvenen des Meerschweinchens, Morphol. Jahrb. **23**:232, 1895.

4. Streeter, G. L.: The Development of the Venous Sinuses of the Dura Mater in the Human Embryo, Am. J. Anat. **18**:145 (Sept.) 1915.

5. Markowski, J.: Entwicklung der Sinus durae matris und der Hirnvenen des Menschen, Bull. internat. Acad. Polonaise d. Sc. et d. Lettres, Cracow, Imprimer de L'Université, 1922.

6. Hochstetter, in Hertwig: Handbuch d. Entwicklungslehre der Wirbeltiers, vol. 3, no. 2, p. 147.

another part through the venous channel referred to. This condition persists in *Ornithorhynchus*. In other mammals (including man) the primitive part of the primary head vein normally becomes obliterated, the later portion formed by the anastomosis persisting. A study of the diagrams in figures 4 and 5 will make clear the aforementioned anastomosis.

By uniting with their fellows of the opposite side, the conjoined anterior and middle plexuses of one side become the superior and

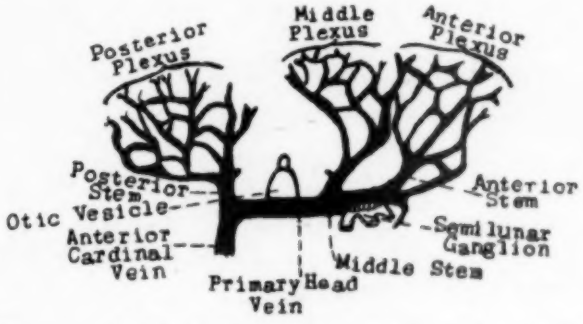

Fig. 4.—Diagram of primary head vein and tributaries (after Streeter).

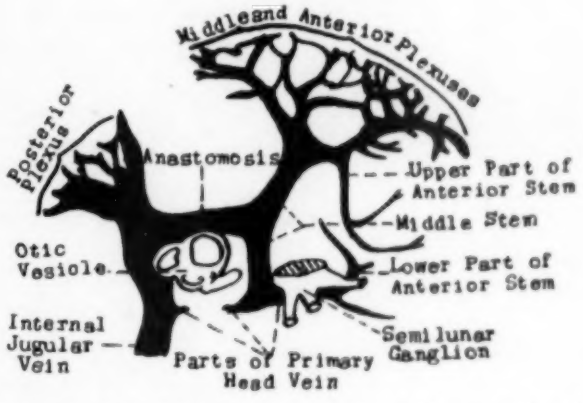

Fig. 5.—Diagram of head veins of an embryo of 21 mm. (after Streeter).

inferior sagittal sinuses and the straight sinus. By further growth of the hemispheres, the upper part of the tributary of the middle stem on each side is forced backward and then downward until it becomes the horizontal part of the transverse sinus; the anastomosis above the otic region and the tributary of the posterior stem is converted into the sigmoid portion of the transverse sinus.

Of interest also in this connection is the mode of formation of the external jugular vein. In embryos of guinea-pigs this vein is formed

by the union of a branch which has connected the ophthalmic and the anterior facial veins with a vein extending down from the region of the ear. The external jugular unites somewhat later with the sinus transversus by an anastomosis through the foramen jugulare spurium. Hochstetter [6] stated:

> This anastomosis becomes more and more prominent, and brings more and more blood from the sinus transversus to the external jugular, with the result that the internal jugular always becomes narrower and finally entirely disappears. Thus the vena jugulare externa becomes the chief channel for the venous blood of the head, in this and apparently all other mammals possessing a foramen jugulare spurium.

Keeping in mind the outline of the venous development inside the skull, one sees that this circulation is by no means constant for all

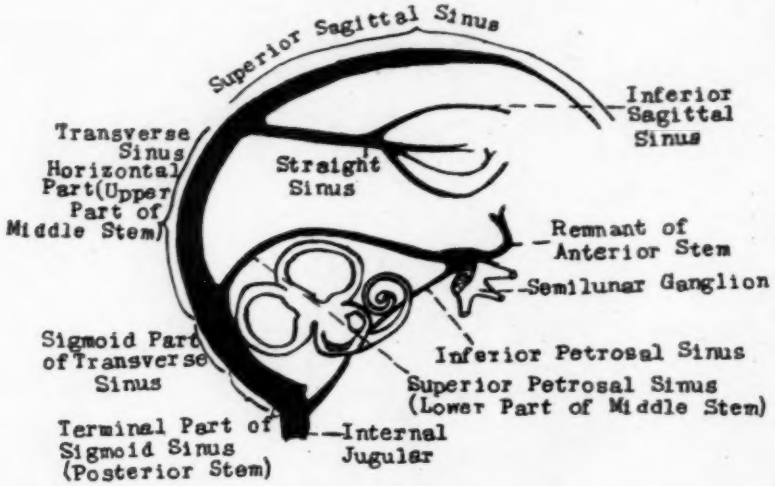
Superior Sagittal Sinus
Inferior Sagittal Sinus
Transverse Sinus
Horizontal Part (Upper Part of Middle Stem)
Straight Sinus
Remnant of Anterior Stem
Semilunar Ganglion
Sigmoid Part of Transverse Sinus
Inferior Petrosal Sinus
Superior Petrosal Sinus (Lower Part of Middle Stem)
Terminal Part of Sigmoid Sinus (Posterior Stem)
Internal Jugular

Fig. 6.—Diagram of the venous sinuses (only one transverse sinus shown). After Cunningham: Anatomy, ed. 5, New York, William Wood & Company.

mammals. It is interesting to note also that in certain animals, such as the guinea-pig and dog, the internal jugular vein as such does not exist, its function being carried on by the external jugular vein; that is, the latter "becomes the chief channel for the venous blood of the head."

COMMENT

Returning now to the specimens, and in the light of what has preceded, I shall venture certain opinions. Looking again at the sketch picturing the sinus petrosquamosus (fig. 3), one recognizes it now as the remains of that primitive blood channel in the embryo which lay lateral to the otic vesicle. In speaking of the condition existing in an embryo of 20 mm., Streeter stated:

Tracing the cavernous sinus backward, it can be seen that the interruption between it and the internal jugular vein is complete, though there is still a remnant of that connection, which extends as a blind channel a short way along the facial nerve. It is interesting to note that we occasionally find in the adult skull a persisent foramen, the "foramen jugulare spurium of Luschka," which corresponds to the exit of the decadent channel. The vein itself, however, has never been described as persisting, although it exists normally in lower forms as a drainage for the anterior part of the brain, passing through this extracranial course to empty into the internal jugular vein.

The anomaly referred to, therefore, may be looked on as the remains of that venous channel which normally exists for a time in the human embryo and persists in some mammals during postfetal life.

A summary of the developmental factors involved will be of assistance in an explanation of the absence of the sigmoid sinus in the first specimen. Here it was shown that the right sigmoid sinus was entirely absent, its function in part being taken up by a large mastoid emissary draining into the external jugular system. The internal jugular vein was a small channel and served only to receive the blood from the inferior petrosal sinus.

By comparing figure 6 with figures 1 and 3, one notes that that portion of the transverse sinus lacking in my specimen is that represented by the tributary of the posterior stem. That part of the transverse sinus (horizontal part) originating from the upper portion of the tributary of the middle stem is present and drains into the enlarged mastoid emissarium. However, the derivative of the lower part of the middle stem, the superior petrosal sinus, is also lacking. Thus it is seen that the representatives of those elements which enter into the formation of the anastomosing channel (the posterior stem tributary plus the lower part of the middle stem tributary) are the ones absent in my specimen. It may be reasonable, therefore, to conclude that, owing perhaps to some disturbance in the mechanical factors involved in normal development, this anastomosis probably never did take place.

Without such anastomosis the venous drainage had to undergo certain modifications. Thus, a large mastoid emissarium developed to enable it to carry the blood from the horizontal portion of the transverse sinus to the external jugular system, while the internal jugular vein, receiving only the blood from the inferior petrosal sinus, remained correspondingly underdeveloped and lacking in a bulb.

406 Metropolitan Building.

OCCURRENCE OF EOSINOPHILS IN THE MUCOUS MEMBRANE OF THE MAXILLARY SINUS IN ASTHMATIC PATIENTS*

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AND
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Clinical experience has firmly established the relationship of rhinologic disturbances to asthma. The generally prevailing view is that certain types of asthma are affected by disease of the upper respiratory system, and it is that which is predominately concerned. That other regions are concerned is often manifested either through toxic conditions, allergic phenomena or through reflex actions. Since we are concerned only with that form of asthma which is caused by or associated with a rhinologic disturbance, we shall therefore omit all other causes.

The importance of a nasal factor in asthma can be gaged from several considerations. We have observed that asthma is often associated with vasomotor rhinitis, recurrent rhinitis, hay-fever, nasal polypi and similar conditions. In analyzing a group of cases, we have found that in about 75 per cent nasal polypi were secondary to a pathologic process in the maxillary sinus, and a fair percentage of these culminated in asthma. Our attention was therefore drawn to the pathologic change in the maxillary sinuses and its relationship to asthma, The pathologic consideration cannot be too much emphasized. In the microscopic study of the mucous membrane of maxillary sinus tissues, we found that there are certain characteristic cellular elements that are constantly present in the tissues. Among these are the polymorphonuclears, lymphocytes and the eosinophils. These are found in the tunica propria. The eosinophil is a factor in all inflammations irritative rather than infective in character. It is a constant component factor when the tissues are edematous, as in hay-fever and vasomotor rhinitis (as pointed out by the late Harry P. Finck [1]).

The lymphocyte is present where chronicity ensues, while the polymorphonuclear leukocyte appears during suppuration and replaces the other cellular elements. In a group of asthmatic cases associated with suppuration of the maxillary sinus, the eosinophil was an element that

* Submitted for publication, Aug. 30, 1929.

1. Finck, Harry P.: Tissue Changes in the Nasal Mucosa, Tr. Am. Laryng., Rhin. & Otol. Soc. **33**:63, 1927.

was constantly present in such a profound proportion that we felt that this characteristic should be regarded as a distinct entity, and we are therefore presenting this subject for consideration.

The hypothesis is this: It is true that eosinophils are found in the blood, and it is also an established fact that eosinophilia is found in the various subacute and chronic diseases, among which are the various rheumatoid conditions, diseases caused by intestinal parasites, chorea, asthma and other conditions. In view of the fact that the eosinophil is the cellular element present in the blood in these chronic conditions, the following questions arise: First, is it a result of a protein disturbance or a phenomenon present in allergy, or is it simply a reaction to stimuli of a specific or nonspecific character? The question in our minds has always been: Is the mucous membrane itself the harboring factor in the causation of asthma? Often one is led to believe that such may be the case because of the great proportion of eosinophils that we have observed in some of these tissues. Second, is the eosinophil the result of some form of protein split-up liberating certain substances that produce a form of allergy and secondarily causing asthma, or is it not? Third, can we ascribe it to lessened ciliary motility or ciliary changes which obviously cause impediment to the removal of the secretions with a certain amount of secretory stagnation, or is it a consequential protein split-up with a production of various enzymes that probably cause asthma? Fourth, in several specimens, we found lymphocytes, polymorphonuclear leukocytes and a great number of eosinophils. At the time of operation, free pus was found. Would this observation point toward bacterial infection as a causative factor in the production of asthma, or is the infection incidental rather than actual? Fifth, is asthma a mechanical disturbance resulting from the edematous tissue throughout the nasal and maxillary sinus mucous membrane, or is it a combination of the edema plus the secondary infection?

Various sensitization tests were made on these patients. Some were sensitive to pollens and others to various foods, while the reactions in some were negative. The outstanding features of some of the allergic cases in which the patients were tested were the abnormal dermal reactions. Those patients who had positive reactions were desensitized, but few responded to the treatment. In another group, both vaccines and protein extracts were administered, but the conditions were not amenable to this form of treatment, some patients even becoming worse. This observation leads one to suspect that when a great number of eosinophils are present, protein inoculations, whether they are vaccines or substances to which the patient showed a reaction, may be a detriment rather than an aid. This may be explained by the fact that we already have a protein cellular imbalance, and therefore the protein

inoculated may aggravate rather than improve the condition. Fink observed that when infection takes place, the eosinophil disappears and the other cellular elements, such as the polymorphonuclear leukocytes, make their appearance. This may be a point in favor of large doses of vaccine which produce reactions with possible cellular changes from the eosinophil to the polymorphonuclear leukocyte or to the lymphocyte.

Clinical observation seems, therefore, to suggest the eradication of local infective conditions, and also favors the idea that the local pathologic process is a factor in the causation of asthma.

Fig. 1.—Section of mucous membrane from a healthy antrum of Highmore (objective $\frac{2}{3}$; eye piece no. 2). This section shows fragments of normal mucosa and submucosa.

The results that were obtained from the patients on whom radical operations on the maxillary sinus were performed may be divided into those that were "cured," "benefited," "greatly relieved" and "not worse." It would be interesting to know whether the eosinophils recur after radical operations on the maxillary sinuses are performed and how soon after operation they appear, which would be ascertained only by secondary operation.

The pathologic process found in the study of fifty cases of chronic maxillary sinusitis in which the patients were operated on radically consisted of hypertrophic or atrophic mucous membrane, polyps or a

combination of both hypertrophic and atrophic tissues. The cellular elements in the tissues were: round cell infiltration, lymphocytes, polymorphonuclear leukocytes and occasional eosinophils in the non-asthmatic group. The asthmatic membrane presented a predominance of eosinophils with some polymorphonuclear leukocytes and lymphocytes. In brief, the pathologic histology obtained from the mucous membrane from the antrums of asthmatic patients was as follows: Columnar epithelial cells cover the surface of the tissue. The cell lining

Fig. 2.—Section of mucosa of an infected antrum of Highmore showing hypertrophic changes of fibromyxoma (polyp) (objective ⅔; eye piece no. 2). The columnar epithelium of the mucosa shows marked catarrhal changes along with myxomatous degeneration of the submucosa with lymphocytic infiltration due to chronic infection.

often dips down deeply into the connective tissue and forms small crevices which in some cases branch. In a number of instances, the epithelial cells were hydropic and overlaid with a thick amount of mucus. Occasionally we found several layers of cells. Directly beneath the basement membrane there is an acellular hyaline zone. Beyond this there are areas of edematous connective tissue which contain many cells.

The eosinophilic leukocytes predominate. The remaining cells consist of polymorphonuclear leukocytes and lymphocytes.

In the accompanying illustrations the histopathology of the maxillary tissues is seen. From these one is able to visualize the contrast between the normal and the various types of the nonmalignant pathologic tissues encountered in various chronic maxillary diseases.

Figure 6 illustrates the typical type of tissue found in asthmatic patients showing the epithelium, the tunica propria and the predominance of the eosinophil, the occasional lymphocytes and the polymorphonuclear cells.

Fig. 3.—Section of mucosa of an infected antrum of Highmore showing hypertrophic changes of cystic fibromyxoma (objective ⅔; eye piece no. 2). The columnar epithelium of the mucosa shows some catarrhal changes along with cystic distention of glands in the submucosa, myxomatous degeneration and small round cell infiltration.

The following case is typical of those in the asthmatic group.

REPORT OF CASE

History.—M. P., a woman, aged 60, gave a history of stuffiness of the nose, profuse rhinorrhea and recurrent attacks of asthma and dyspnea for nearly three years. Several nasal operations had been performed on the patient; namely, submucous resection, removal of polyps, exenteration of the nasal maxillary sinus on

the left side and partial exenteration of the ethmoids. The general symptoms were asthma, dyspnea and severe cough.

Examination.—There was a vasomotor appearance of the mucous membrane of the nose. It was difficult to contract with shrinking solutions. Small polyps were seen on the right side around the middle meatus. The nasopharyngoscope showed the presence of polyps. On transillumination both maxillary sinuses were cloudy. On puncture, pus was found on the right side consistently and occasionally on the left side. Roentgen examination revealed cloudy maxillary sinuses.

No improvement in symptoms followed repeated irrigations. Iodized poppy seed oil 40 per cent was instilled in the antrums, and an x-ray picture showed little displacement.

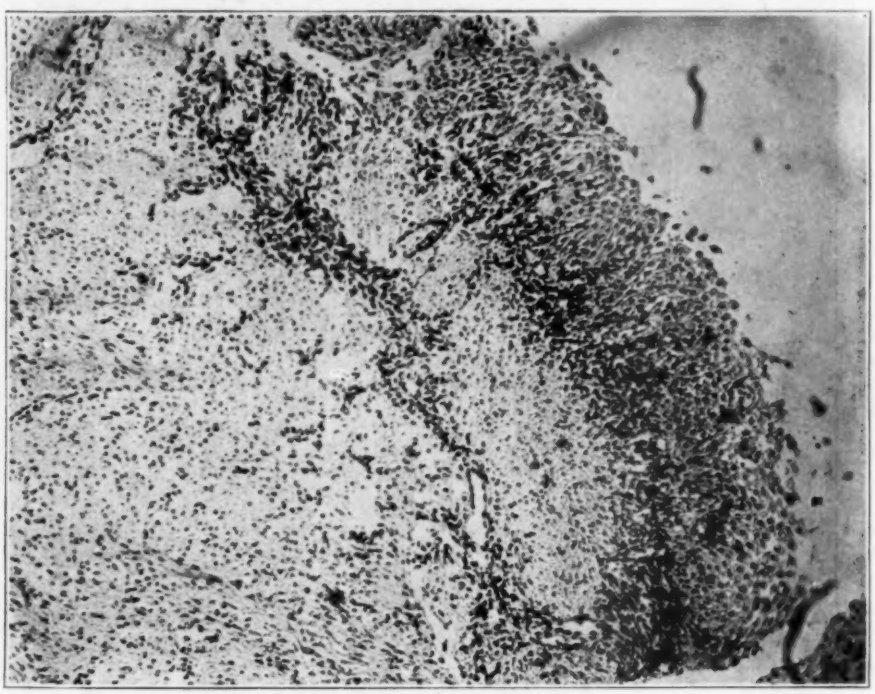

Fig. 4.—Section of mucosa of an infected antrum of Highmore showing early atrophic changes (objective 1/6; eye piece no. 4). This section of higher magnification shows desquamation of the epithelium of the mucosa along with more mature fibrous tissues in the submucosa with beginning contraction.

Operation and Course.—Polyps and pus were removed, and a bilateral Caldwell-Luc operation was performed.

Bacteriologic study revealed the presence of *Streptococcus hemolyticus.* Microscopically, fibromyxoma with chronic inflammatory tissue was seen.

The patient had no abatement of symptoms after submucous resection, removal of polyps and intranasal maxillary operation. After a bilateral Caldwell-Luc operation was performed, all asthmatic symptoms disappeared, and up to the time this article was written (two years later) symptoms have not recurred.

To make a brief summary of the subject, we advance the following conclusions:

1. The asthmatic patients on whom Caldwell-Luc operations were performed represented three types: (*a*) the hydropic or vasomotor type, (*b*) the suppurative type and (*c*) the nonsuppurative type. These, from a rhinologic standpoint, presented different symptoms, but in our histopathologic study we found that the eosinophil was the predominant cell.

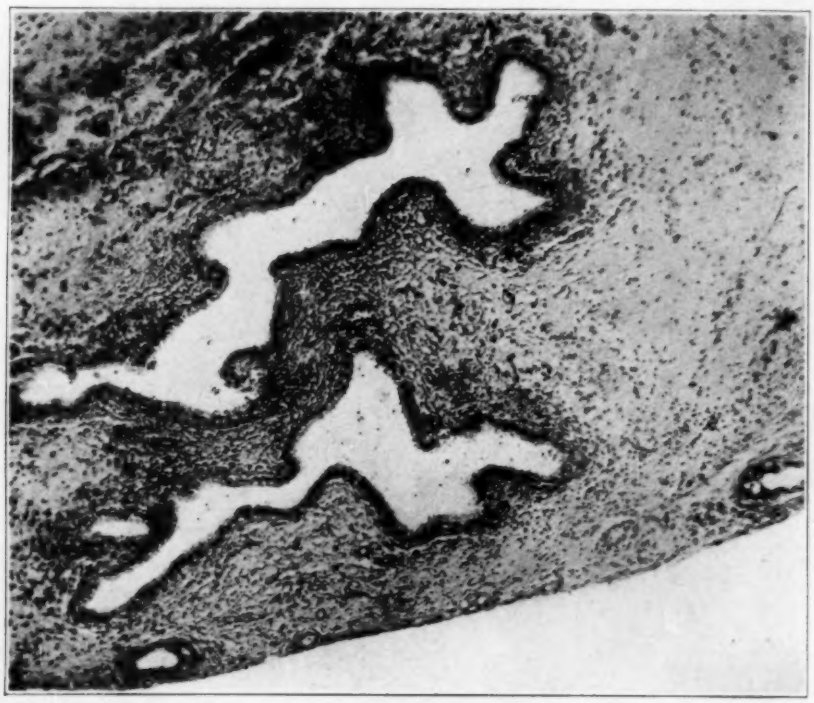

Fig. 5.—Section of mucosa of an infected antrum of Highmore showing hypertrophic and atrophic changes (objective 2/3; eye piece no. 4). Section of the tissue from Mrs. B. showing chronic fibrous and atrophic changes in the mucosa and submucosa of the tissue from the maxillary sinus.

2. The cellular elements present were: polymorphonuclear leukocytes, lymphocytes and eosinophils. The polymorphonuclear leukocytes and the lymphocyte cells were found in great proportion in the nonasthmatic patients, but the eosinophil was found in abundance in the pathologic tissues of the asthmatic patients.

3. *Streptococcus hemolyticus* was the organism isolated in the study of the asthmatic cases.

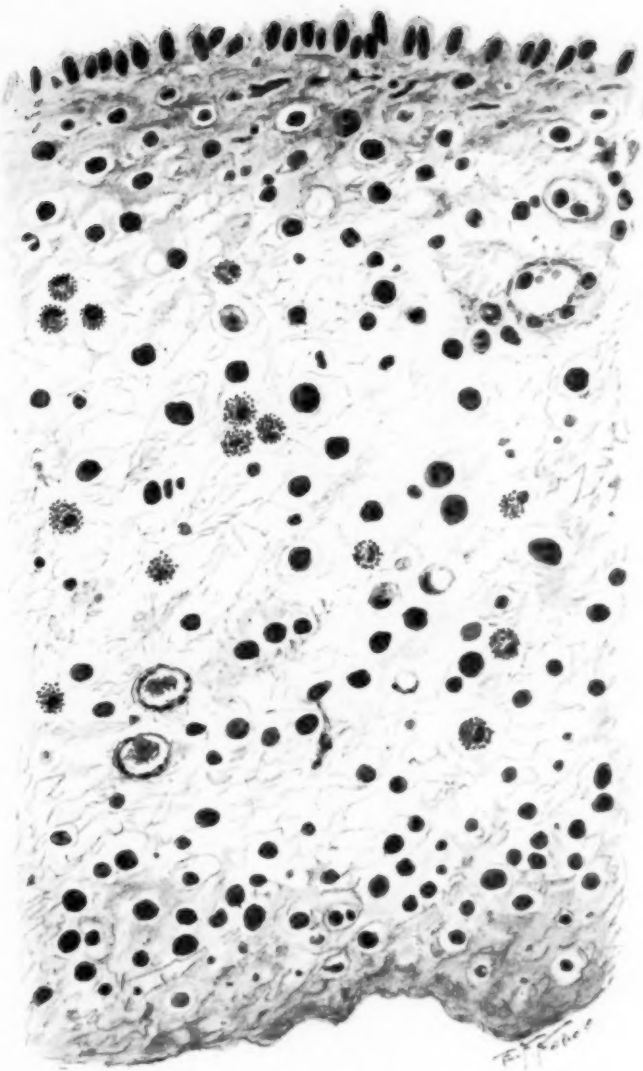

Fig. 6.—Mucous membrane of antrum of asthmatic patient. This figure shows columnar epithelium and hydropic areas, and beneath the basement membrane we find the eosinophils predominating. The cells are polymorphonuclear leukocytes and lymphocytes with a higher power; the eosinophils may be seen within the blood vessels.

UNIV. OF MICH.

4. The question of tissue regeneration and cellular element recurrence is of great interest. A patient comes to mind whose symptoms reappeared three years after operation. Why? According to Knowlton,[2] there is a regeneration of nasal mucous membrane following radical operation on the maxillary sinus. We have not had the privilege of reoperating on our own patients so as to determine the pathologic process and cytology present, but it is possible that after a three years' quiescence, there may follow a recurrence of symptoms, and the new tissue formed can be reinfected. This would be a point in favor of the theory that a local pathologic process is a factor in the causation of asthma.

Schilling and Gradwohl [3] promulgated the idea that the eosinophil is a cell that is present in the blood normally. They further stated that during acute infection there is a disappearance of the eosinophil, it being replaced by the polymorphonuclear leukocyte or the lymphocyte. This observation does not coincide entirely with our results. There are several explanations for this. Among them is the ratio and its relationship to the other cellular elements. Normally, in an ordinary blood count one finds one eosinophil to the average count. In acute infection, there is a disproportionate increase in the polymorphonuclear leukocytes, and when there is a tendency to chronicity—there is an increase in the lymphocytes. Using the eosinophil as 1 in the ratio, it is natural to expect that when there is an actual increase in the other cellular elements, the eosinophil naturally remains nil.

We found, on the other hand, that the eosinophil is present in the mucous membrane of an asthmatic patient in conjunction with purulent conditions in the same membrane. Therefore, it seems logical to assume that the asthma and the presence of the eosinophil in the mucous membrane must be closely associated.

ABSTRACT OF DISCUSSION

DR. HARRY D. EARL, San Pedro, Calif.: I wonder if any one knows what is the function of the eosinophil? If its function were known, the problem that Dr. Coates has attacked would be more easily solved. Now that Dr. Coates has found it in large numbers in the mucosa of asthmatic patients with chronic disease of the antrum, at once the question arises, what of the other sinuses in these cases? Is there an increase of eosinophils in the mucosa of the frontal, the ethmoid and the sphenoid of these patients, or is the increase confined to the antrum? The fact that so many of the patients in Dr. Coates' cases were cured by radical operations on the antrum, not only of the condition of the antrum but of the asthma as well, indicates that the antrum plays a more important and far-reaching rôle in diseases of the respiratory tract than we have attributed to it.

2. Knowlton, Charles D.: How and When the Mucous Membrane of the Maxillary Sinus Regenerates: An Experimental Study in the Dog, Arch. Otolaryng. **8**:647 (Dec.) 1928.

3. Schilling and Gradwohl: The Blood Picture, ed. 7 and 8.

We have seen cases of acute pansinusitis and bronchitis in which the patients were relieved promptly and then cured simply by repeated puncture and lavage of the antrums. This being a fact, does it not tend to substantiate in part Dr. Coates' observations, namely, the cure of asthma by curing the antrums in patients with pathologic changes in the sinus?

Dr. Harry L. Baum, Denver: The authors have not answered any of the questions they have raised. I presume they did not intend to answer these questions, but to bring them before us for our consideration and for our answer if we have one. I, too, have considered them with deep interest for a considerable length of time, but so far I have been unable to prove any of the conclusions I have drawn. I have some theories, in some of which I believe rather firmly, but I have no proof. The question of the association of asthma with certain conditions in the nose is, of course, firmly established. First, with many known allergic conditions such as hay-fever and vasomotor rhinitis, and second, with conditions that are not known certainly to be allergic but which are now more or less accepted as being so, such as the edematous states of the nasal and sinus membranes. The most common, of course, is the nasal polyp. Those who have made a study of the histology of these conditions have recognized the frequent presence of eosinophils in the membranes. The question the essayists ask is briefly this: Is the presence of eosinophils a specific or a nonspecific reaction? I believe it is a nonspecific reaction, because we find eosinophils in the blood and also in other tissues in diseases which have no relation to asthma. I would therefore conclude that it is a reaction to some general underlying condition that we have as yet been unable to explain. Eosinophils are present in the blood and bronchial mucosa as well as in the nasal and sinus membranes in asthmatic patients, so I cannot help but conclude that they are evidence of a reaction to some unknown stimulus and not in any way the cause of the asthma.

The writers of the paper ask five other questions which are all pertinent and interesting. First, is the nasal mucosa a harboring factor in asthma? It is possible, but I do not believe that the changes seen in the nose and sinuses are more than concomitant, simply nasal manifestations of the same state just as the asthmatic attack is a bronchial manifestation of that state. Both are associated conditions; one is not a cause of the other. Second, is the eosinophil the result of protein split-up? That question I shall leave to Dr. George Piness. He knows much more about proteins than I do. Third, what has lessened ciliary activity or stagnation to do with the development of asthma in this type of case? We well know that we frequently find stagnation in these cases as evidenced by pus in the sinuses. What has that to do with the causation of asthma? I would say that it plays a secondary rôle, since there are cases of asthma in which there is no apparent interference with ciliary activity and in which there is no stagnation. Fourth, is the presence of pus in the antrum an indication of the bacterial origin of asthma? The only evidence to bear out this conclusion is the improvement noted as a result of antral drainage in some cases of asthma in which pus is present. Sensitization to bacterial proteins has not been demonstrated; so this hypothesis is difficult to maintain, even in the light of unquestioned therapeutic effect in certain clinical cases. On the other hand, the frequent failure of surgical eradication of suppuration and the failure of treatment by means of desensitization with bacterial proteins lead me to the conclusion that pus is not the active etiologic factor in asthmatic cases with antral suppuration. Fifth, is asthma a mechanical disturbance resulting from the presence of edematous tissue in the sinuses? To this question I would unhesitatingly reply that it is not. Edema is a characteristic and not a cause of all allergic states. We should not confuse cause and effect

in our consideration of allergic states. In conclusion I would emphasize that eosinophilia and edema are the accompaniment of allergic states as manifested in the respiratory mucous membranes, both upper and lower, and do not tell the real story of the underlying cause of asthma. I cannot escape the conviction that they are only symptoms and never causes.

DR. HARRIS P. MOSHER, Boston: It is held now that the eosinophil is found associated with asthma. About a year ago, having established a laboratory for the study of the mucous membranes, we attacked this problem, but frankly, we have not gotten far. The first case was one of asthma with eosinophilic pus in the nose; the antrum was full of eosinophilic pus, and the membrane removed from the antrum was full of eosinophilic pus. That excited us, but we have not been able to repeat that observation. We do not feel that eosinophils are constant in cases of asthma. They are common, but they are not constant. The odd idea has originated in Boston that asthma is not caused by the sensory centers, but is a secondary effect of a constitutional upset, whatever that constitutional upset may be. Dr. Casner has done some splendid work along the line of the histopathology of the mucous membranes of the nose and especially of the antrum. Our observations have been practically his with one exception. In other words, we have not found polymorphonuclear leukocytes in the mucous membrane in great numbers. Why they are not there we cannot make out. I have a suspicion that pus may be an innocent factor — that it is Nature's expression of being able to combat the infection. We found lymphocytes, even in the acute cases, to predominate. I should like to add one thing to what Dr. Coates brought out about the eosinophil. It will disappear promptly after treatment in most cases, either with or without operation, and stay away for five days and then come back — and so does the asthma.

DR. GEORGE PINESS, Los Angeles: The cases studied by Dr. Coates and his workers may be divided into two groups, allergic and nonallergic asthma, the latter because no reactions were obtained by skin testing as well as no etiology determined by means other than the presence of pus in the nasal sinuses. It is, therefore, called bacterial asthma or asthmatic bronchitis. Much work has been done with the latter group in attempting to determine whether or not the subject is bacteria sensitive, but no evidence of specific sensitivity due to bacteria found in the various sinuses and cells of the nose has been offered that is conclusive that they produce bronchial asthma. Our own observations in cases of so-called bacterial asthma are that when pus is present it is usually the result of obstruction of drainage caused by the edema described by Dr. Coates, and despite the free drainage and removal of the focus of infection by surgical measures, little if any success is attained in relieving the patient from his asthma. The presence of eosinophils in bronchial asthma is not constant, as characterized by the case reported by Dr. Mosher. Eosinophils may or may not be present in excess of the normal proportion to other leukocytes. I do not believe that their presence is pathognomonic of allergic disease, as many times they are found in excess in other conditions. The asthmatic patient who presents a picture of round cell infiltration with connective tissue formation has, without a doubt, a bacterial infection, and this is commonly seen in the bacterial type of asthma, but the picture of edema of the mucous membrane throughout the entire respiratory tract with infiltration of leukocytes, eosinophils, etc., is truly allergic. Dr. Coates' observation that patients sensitive to specific proteins who have unusually large numbers of eosinophils present do not respond to specific treatment, does not bear out our own observations. We have noted that equally good results are obtained in those that have unusually large or normal amounts of eosinophils present. It is my belief

that most poor results that occur in sensitive persons are usually due to a failure on the part of the clinician to correlate properly the history of the patient and the results of his laboratory and protein studies. It is believed by most workers that proteins that are split by chemical or physical means or that are denaturized lose their ability to produce allergic reactions.

Dr. Joseph C. Beck, Chicago: After a discussion like this there is not much more to be said, but two facts may have been left out in regard to asthma. One is the work of Sturm Von Leeoven which some in this country discredit, but in Europe we hear so much about his views concerning the specificity of *Aspergillus fumigatus* in asthma, also patients breathing in cabinets or small rooms, that air that has been frozen to a low degree and rewarmed are thus desensitized against *Asperigillus fumigatus*. Dr. Meyers of South Bend, Ind., made a special trip to see this work in Leiden, Holland. He has recently returned, and I am authorized to make the statement that all the facts set forth by Sturm Von Leeoven are not borne out in the cases he has observed, but that the treatment has had a beneficial effect on the patients subjected to it. The work presented by Dr. Coates was interesting to me because I have been studying the mucous membranes of the sinuses in patients with asthma for a long time. I have four photographs in which this fact of eosinophilia in the tissues is not substantiated. In the majority of cases the mucous membrane lining not only of the antrum but of the other sinuses is not found as set forth; it is mostly chronically inflamed, and evidences of chronic edema are present. With reference to the case reported in which there was two years' relief from asthma following operation on the antrum, I want to congratulate Dr. Coates. No other sinus was operated on and therefore two years should be long enough to say that the patient is cured. I am certain that I have never had a patient cured by an operation on the nose alone — cured so that the asthma did not return.

Dr. George M. Coates: This is just an attempt to bring the subject forward. We are all familiar with the work of Finck on the mucous membranes of the nose, and in conversation with Emerson and Tobey they said their observations had been the same as ours, but we were unable to find published reports on this subject. Dr. Beck says he does not find the eosinophils in the proportion we have found them. Of course, our series is small; it is a study of fifty consecutive cases, in which we included nine asthmatic patients, and we were struck by the fact that in the nine patients with asthma we found a preponderance of eosinophils, while in the nonasthmatic subjects we did not find them. I do not know that we cure the asthma any more than we cure cancer or tuberculosis. We cannot call it cured in two years, although we have accomplished something. The patients in these nine cases were relieved for a period — three years is the longest, and in one case there was a recurrence.

THE FREQUENCY OF MASTOIDITIS IN INFANTS*

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Much controversy has arisen regarding the relationship between mastoiditis and acute nutritional disturbances in infants. Since the publications of Marriott, Alden, Floyd, Lyman and many others,[1] a great deal of attention has been given to infections of the middle ear and the mastoid. The work of these men has been so startling that a great number of pediatricians and otologists have, we believe, without careful investigation, more or less blindly followed their teachings.

The contention of most investigators has been that the ear infection acted as the primary focus, and that the enteric disturbance was secondary. The result has been a marked increase in the number of ear drums lanced and mastoids operated on.

Our contribution to this subject is an effort to determine, by careful examination of the end-results, i. e., by necropsy and histologic studies, the correct relationship between enteritis and ear infection.

About a year ago, one of us (O. J. D.) published the results of a survey in cases of mastoidectomies which he had gathered from the private and charity hospitals of Kansas City, with this conclusion: "The mortality rate in infants with enteritis, who had mastoidectomies, was out of all proportion to the usual mortality rate; that is, six and four-tenths as against two and four-tenths normally."

There have been two outstanding contributions to this subject from the standpoint of postmortem and histologic study. The first was by McMahon,[2] who made a careful analysis of the histologic changes in a series of cases in which operation was done. In his first table, he cited eight cases, in six of which the patients died following operation. On analyzing the microscopic observations in the bone from this series, he found that the predominating features were edema, many

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1. Marriott: Observations Concerning the Nature of Nutritional Disturbances, Read before the American Pediatric Society, Washington, D. C., May 5, 1925; quoted by McMahon (footnote 2). Alden, A. M.: Mastoid Infections in Infants, Arch. Otolaryng. **5**:39 (Jan.) 1927. Floyd, M. L.: Masked Mastoiditis Simulating "Alimentary Intoxication" (Anhydremia), Arch. Otolaryng. **1**:411 (April) 1925. Lyman, H. W.: Mastoiditis a Cause of Gastro-Intestinal Disturbances in Infants, J. Missouri M. A. **22**:293 (Aug.) 1925. Dixon, O. J.: The Causes of Death in Mastoiditis, J. A. M. A. **91**:1280 (Oct. 27) 1928.

2. McMahon, B. J.: The Pathology of Mastoiditis in Infants, Arch. Otolaryng. **7**:13 (Jan.) 1928.

red cells and pus cells. McMahon stressed the presence of edema. Bony necrosis, he stated, was either slight or not present. All these observations show the reaction to be obviously early and acute. In a personal communication to the authors, he stated that the diarrhea-vomiting complex was of much longer duration, clinically, than the ear symptoms, when the latter were present. This, we think, and will try to show later, is in accord with the microscopic observations, and corresponds well with the observations in our cases.

The second noteworthy contribution, and of a somewhat different nature, was that of Richards,[3] of Boston, who reviewed the records of postmortem examinations of 120 infants, with particular attention to the observations in the ears and mastoids. His figures showed little difference as regards changes in the ears between infants dying from nonnutritional and those dying from nutritional disturbances, and he concluded that "the infection of the middle ear with, or without, mastoiditis, is, in infants at least, a prevalent complication of a large number of fatal illnesses, and that the opinion that this local aural infection is a factor of peculiar etiologic significance in acute nutritional diseases is not borne out by these authentic figures" (i. e., postmortem observations).

In 1926, when the publications regarding middle ear and mastoid infections as the primary foci came to our attention, we were obtaining a high percentage of postmortem examinations on infants dying at Children's Mercy Hospital, and were struck by the fact that we found pus in the middle ears and mastoid antrums in a large number of infants dying from all types of diseases. Therefore, we began making careful postmortem studies of all cases in which mastoiditis was encountered. This investigation comprises a series of 173 postmortem examinations taken in sequence from January, 1927 to June 1, 1929. The patients came from the entire pediatric and otologic services of the Children's Mercy Hospital. The most interesting and instructive part of the study is, perhaps, the fact that the opinion of the attending staff regarding the etiologic significance of ear infection in enteritis was about equally divided.

In this series of 173 necropsies, we encountered fifty-seven cases in which changes were present either in the middle ear or in the mastoid or in both (32.8 per cent). This demonstrates the striking frequency of this complication. We have therefore tried to make a careful analysis of these fifty-seven cases in an effort to determine the relationship of mastoiditis to enteritis.

A review of the accompanying table reveals the following facts: In only seventeen of these fifty-seven cases was there evidence of

3. Richards, Lyman: Mastoiditis in Acute Nutritional Disturbance, Arch. Surg. **18**:1774 (April) 1929.

TABLE 1.—*Observations in Cases Showing Ear Involvement*

Necropsy Number	Age of Child	Sex	Primary Disease	Duration	Mastoidectomy	Postmortem Observations		
						Mastoid	Bone Changes	Complications
27- 2	19 months	F	Tuberculosis; cervical cellulitis	14 days	None	Bilateral purulent mastoiditis	Slight	Cellulitis of neck
27- 4	3 months	F	Cellulitis of scalp	3 days	Bilateral paracentesis; no mastoidectomy	Only mucus in mastoid	None	Pneumonia
27-10	8 years	M	Peritonsillar abscess	21 days	None	Mucus in mastoid, with streptococcus	None	Measles; myocarditis
27-11	24 months	M	Measles; streptococcic pharyngitis; bronchitis	90 days	None	Mucus in mastoid	None	Cellulitis of neck; gonorrheal urethritis
27-16	1 month	M	Feeding case	Since birth	None	Thick yellow-green pus	Some	Septicemia; acute pancreatitis; myocarditis
27-20	7 months	M	Malnutrition; rickets; never developed	Since 4 weeks of age	None	Mucus in left mastoid; pus in right mastoid	None	Bronchopneumonia
27-22	Unknown, under 1 year	M	Extreme emaciation; dehydration	21 days	None	Mucus in mastoid	None	None
27-24	Unknown	F	Pneumonia	Unknown	None	Pus	Necrosis	Abscess of lung; meningitis
27-25	6 months	F	Acute diarrhea	7 days	Bilateral paracentesis; no mastoidectomy	None	None	Bled to death from drum incision
27-26	4 months	F	Cellulitis of scalp, with abscess	10 days	None	Pus, bilateral, streptococcic	None	Terminal mastoiditis; septicemia
27-28	5 months	M	Primary mastoiditis	14 days	Right-side mastoidectomy	Broken down	Present	Meningitis
27-31	7 months	F	Von Jaksch anemia	14 days	None	Otitis; mastoiditis	Present	Measles
27-32	11 months	M	Feeding case	30 days	None	Bilateral otitis and mastoiditis	None	Pneumonia; multiple abscesses
27-33	1 month	M	Pemphigus; infection of kidney	22 days	None	Pus in left mastoid; suppurative streptococcic otitis in right ear	None	Jaundiced; dehydrated; bronchopneumonia; pyelonephritis
27-36	1 month	M	Mastoiditis	3 days	None	Thick green pus in right mastoid; left clean	None	Massive hemorrhage of the brain
27-40	12 months	F	Pneumonia	7 days	None	Right-side mastoiditis; otitis	Slight	Toxic myocarditis
27-62	8 months	F	General miliary tuberculosis	30 days	Bilateral	None	Slight	None
28- 2	22 months	M	Bronchopneumonia	6 days	None	Foul, thick pus	Slight	Nephritis
28- 6	5 months	M	Mumps	60 days	Paracentesis; mastoidectomy	Bilateral purulent otitis	None	None
28-12	24 months	M	Diarrhea	14 days	Bilateral mastoidectomy; earlier paracentesis	None	Necrosis	Pachymeningitis

TABLE 1.—*Observations in Cases Showing Ear Involvement—Continued*

Necropsy Number	Age of Child	Sex	Primary Disease	Duration	Mastoidectomy	Postmortem Observations: Mastoid	Postmortem Observations: Bone Changes	Postmortem Observations: Complications
28-13	11 months	M	Rickets	30 days	Bilateral mastoidectomy	Slight changes; pus	None	Bronchopneumonia
28-23	3 months	M	Bronchopneumonia	10 days	Bilateral mastoidectomy; paracentesis	Left side, mastoid and antrum infected	None	None
28-27	3 years	M	Pneumonia	120 days	Bilateral mastoidectomy; paracentesis	Broken down	Present	Empyema; pneumonia
28-28	9 years	F	Pharyngeal abscess	35 days	Bilateral mastoidectomy; paracentesis	Seropurulent	None	Impetigo; malnutrition; terminal bronchopneumonia
28-29	18 months	M	Diarrhea	21 days	None	Pus	Slight	Bronchopneumonia
28-33	10 months	F	Diarrhea; intestinal upset	42 days	None	Ruptured drum; fairly dry ear	None	None
28-34	8 months	F	Pyelonephrosis; suppurative nephritis	12 days	No mastoidectomy; paracentesis	Bilateral otitis	None	None
28-36	3 months	M	Enteritis	10 days	No mastoidectomy; paracentesis	Polymorphonuclear infiltration	No caries	None
28-43	3 months	M	Tuberculosis; septicemia	Unknown	Bilateral	Pus	None	Multiple abscesses of lung
28-44	3 months	M	Diarrhea	7 days	No mastoidectomy; paracentesis	Small amount mucus	None	None
28-45	2 years	M	Chronic ulcerative ileocolitis	35 days	Bilateral	Pus	None	None
28-47	3 months	M	Enteritis	21 days	Bilateral	Bilateral mastoiditis with pus	No caries	Furunculosis; bilateral confluent bronchonopneumonia
28-49	5 weeks	M	Feeding case	14 days	Paracentesis; no mastoidectomy	Thin mucus	None	Pneumonia
28-52	2 months	M	Diarrhea; acute and chronic ileocolitis; marked intestinal change	10 days	Bilateral mastoidectomy; paracentesis	Both middle ears have slight purulent involvement	None	None
28-54	4 months	F	Diarrhea	14 days	None	Filled with thick green pus	None	Terminal ear-complication
28-56	12 months	M	Acute ulcerative membranous enteritis	6 days	Bilateral	Purulent otitis; mastoiditis	None	None
28-57	7 months	M	Enteritis; vomiting; general miliary tuberculosis	30 days	Bilateral mastoidectomy	None	None	Tuberculous enteritis
28-58	2 months	M	Congenital syphilis; feeding case	30 days	Bilateral mastoidectomy	Pus in mastoid	Slight	Pneumonia

TABLE 1.—*Observations in Cases Showing Ear Involvement—Continued*

Necropsy Number	Age of Child	Sex	Primary Disease	Duration	Mastoidectomy	Postmortem Observations: Mastoid	Postmortem Observations: Bone Changes	Postmortem Observations: Complications
28-63	2 months	..	Sepsis; malnutrition	23 days	Bilateral mastoidectomy; paracentesis	Granulations	Bone lost	Abscesses of lung
28-66	5 months	F	Enteritis	90 days	Bilateral mastoidectomy; paracentesis	Pus; granulations	None	Erysipelas
28-67	4 months	M	Severe malnutrition; diarrhea	Unknown	None	Bilateral purulent mastoiditis	None	None
28-68	8 months	M	Dehydration; malnutrition	42 days	None	Stringy mucus in middle ear	None	Bronchopneumonia
29-2	8 months	F	Dehydration	21 days	No mastoidectomy; paracentesis	Purulent drainage; granulation in ears	None	None
29-5	8 months	F	Bronchopneumonia; empyema	12 days	None	Pus, bilateral	None	Cellulitis of neck
29-6	12 months	M	Asthma; bronchopneumonia	21 days	Bilateral mastoidectomy; paracentesis	Thick pus	None	Nephritis
29-7	3 months	M	Bronchopneumonia	7 days	No mastoidectomy; paracentesis	Otitis	None	None
29-8	14 months	F	Feeding case	14 days	Bilateral	Pus in right side	None	Peritonitis following injection of dextrose, with punctured intestine
29-9	12 months	M	Bronchopneumonia; erysipelas from which recovery had been made; pertussis	30 days	None	None	None	Abscess of scalp; septic infarcts in lung; septicemia
29-10	7 years	F	Pharyngitis	21 days	None	Bilateral otitis media	None	Septicemia; multiple abscesses
29-12	10 months	M	Diarrhea	10 days	None	Bilateral mastoiditis	Slight necrosis	Pneumonia
29-13	7 months	M	Dehydration	8 days	None	None	None	Bronchopneumonia
29-14	10 months	F	Dehydration; diarrhea	30 days	None	Acute purulent infection of antrum and middle ear	None	Measles; pneumonia
29-20	12 months	M	Rickets; malnutrition	60 days	Paracentesis; no mastoidectomy	Terminal bilateral otitis media and mastoiditis	None	Anemia; scabies
29-21	12 months	M	Feeding case of long standing	210 days	Paracentesis; no mastoidectomy	Terminal mastoiditis	Slight	None
29-28	9 months	F	Enteritis	25 days	Paracentesis; no mastoidectomy	Acute bilateral otitis and mastoiditis	Slight	Pneumonia
29-30	5 weeks	F	Malnutrition; club feet	14 days	None	Bilateral mastoiditis	Slight	Bronchopneumonia
29-32	2 years	M	Mastoiditis	14 days	Bilateral paracentesis; no mastoidectomy	Mastoiditis	Marked	Pneumococcic meningitis

enteric infection, while in the remaining forty, almost every common disease of infancy was represented. A large majority of the infants were under 1 year of age and therefore were of an age when complications are frequent. As can be seen, the incidence of the ear and mastoid infection was much higher in the nonenteric than in the enteric group. Both gross and histologic examination of these mastoids and

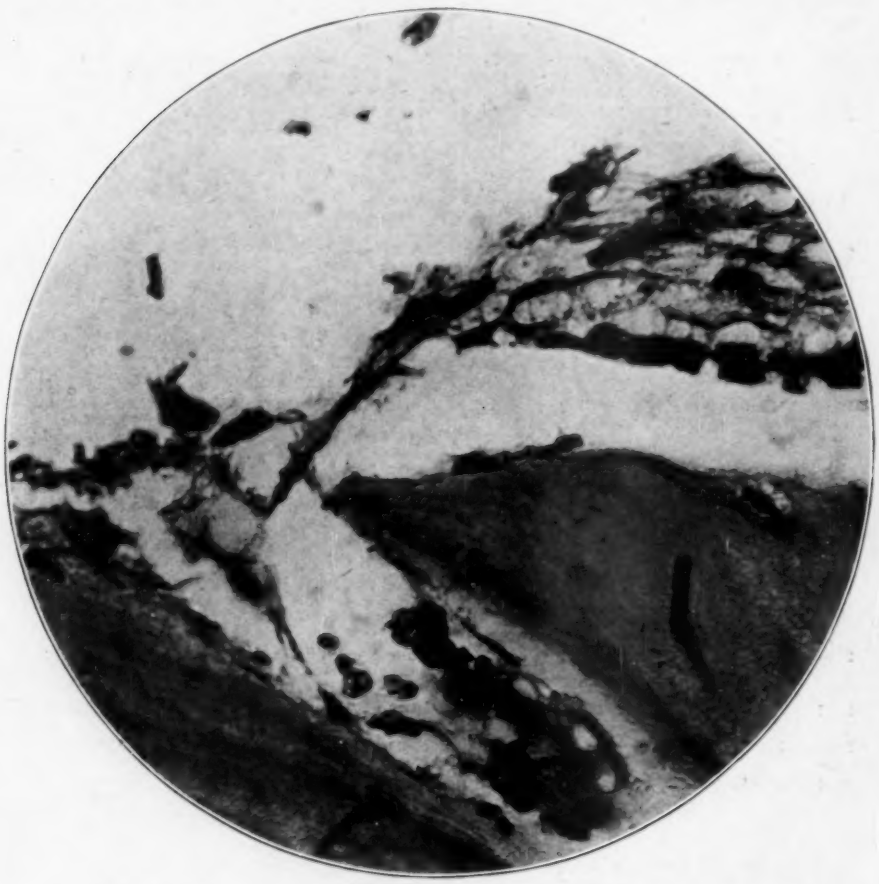

Fig. 1.—Early mucous type of inflammation in the mastoid; × 700. No bony change is seen; the epithelium is swollen, pus cells are rare and red cells are present. The duration of the primary illness was three weeks.

middle ears showed, in the majority, little evidence of bony necrosis. In the mucus-containing type of mastoid, about all that was found was edema and swelling of the epithelium, although the mucus contained pus cells and organisms. Sometimes, when frank suppuration was encountered, we found early bony necrosis, but oftener the

bone was intact and the epithelium still present. In fact, the predominant picture was that of a purulent exudate, rich in pus cells, without death of bone. The presence of young connective tissue may readily be misinterpreted, since, in infants, myxomatous tissue and young connective tissue are present in the antrum beneath the mucosa normally.

Fig. 2.—Mastoid showing desquamation of the epithelium and early exudate of pus but no bony change; × 700. The duration of the primary illness was ten days. This represents the most frequent picture.

A careful study has convinced us that the histologic observations fit in rather accurately with the clinical observations. We do not think that the mastoid symptoms preceded the diarrhea-vomiting complex in the cases that we studied, since they resemble identically those found in

the nondiarrheic child. In two cases of the enteric group, both gross and histologic examination of the intestines showed old ulcerative changes in the mucosa. The ear disturbances were both grossly and histologically of brief duration. Only in three cases of the entire fifty-seven could the mastoid infection have been considered as the primary cause of death. In this series of fifty-seven cases, 41.1 per cent of the

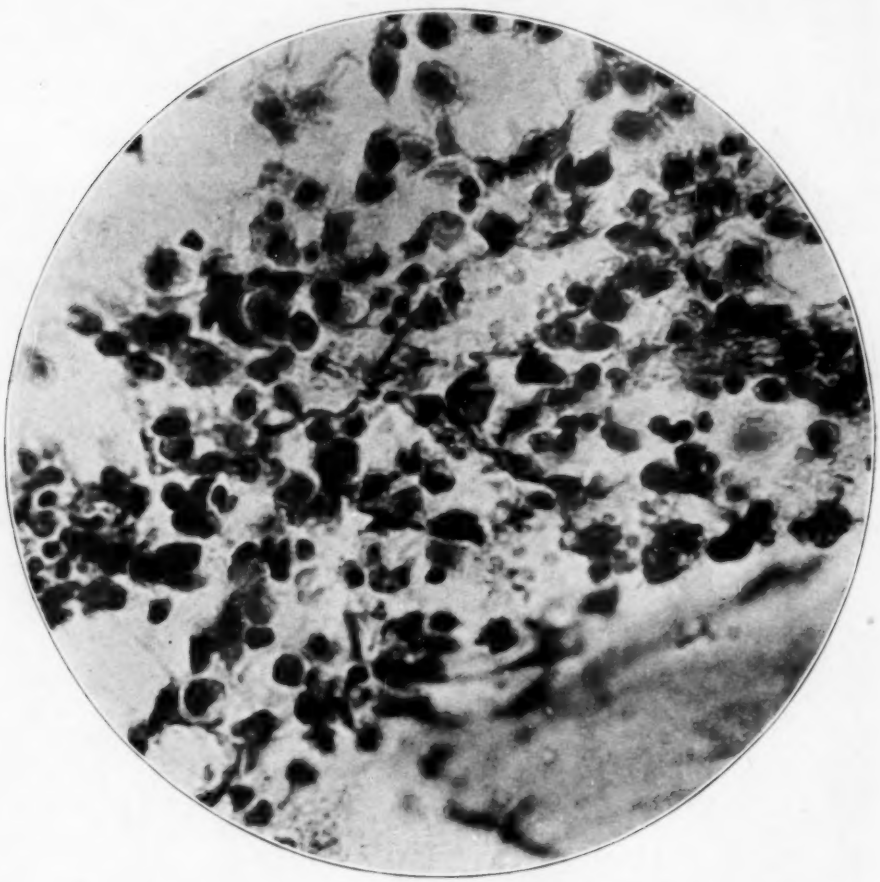

Fig. 3.—Mastoid showing purulent exudation and marked epithelial desquamation but no bony change; × 700. The duration of the primary disease was one month.

infants who gave a history of diarrhea died following operation for mastoiditis. The bony changes were either slight or negligible, in most of them. In every case, the history of diarrhea antedated that of the ear infection.

CONCLUSIONS

1. In the usual fatal illnesses of infants, ear infection is a common terminal event.

2. Enteritis, as shown by necropsy, too frequently antedates the ear infection for one to assume that the latter is primary.

3. The mortality rate of these infants coming to operation was high and distinctly out of proportion to the usual mortality rate.

4. From this study we conclude that although surgical mastoiditis does occur in infants, its importance has been vastly overrated.

CARDIOSPASM*

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The following names are the various synonyms suggested for cardiospasm: ingluviosis, preventriculosis, achalasia, phrenospasm, hiatal esophagismus and stenosis of the lower end of the esophagus.

ETIOLOGY

Jackson [1] has said that "anatomic, pathologic, fluoroscopic, esophagoscopic and clinical studies have shown that the disease in a large proportion of cases is not spasmodic."

The condition has been considered as a neurosis. McKinney, Guisez, Plummer, Sargnon and others have considered it as endocrine imbalance. Mosher has demonstrated by fluoroscopic and anatomic studies that there is some pathologic change in the liver tunnel which causes this condition. He has shown that there are certain cases in which the compression stenosis caused by the liver has produced this phenomenon. In other cases, cicatrices and adhesions were the organic factors of the obstruction. Pathologic conditions of the lower lobe of the left lung have been considered as factors in producing this abnormality. Jackson has demonstrated physiologically that there is a kinking of the abdominal esophagus, and that there is a diaphragmatic pinchcock. The stricture of the musculature and the structure and position of the crura seem to constitute the perfect mechanism for pinching shut the esophagus just as a pinchcock in the chemist's laboratory closes the rubber tube.

Cardiospasm may represent the defense against repressed fellatio fantasies. Nausea is a common symptom of some sex perversions, when the latter are repressed. Greig [2] expressed the belief that there are three factors which exert their influence on cardiospasm: 1. Anatomically, he considered that the esophageal opening of the diaphragm is apparently not modified by movements of the diaphragm and maintains an unvarying diameter. Furthermore, from an anatomic point of view, it is important to realize that the esophagus has in common with the lungs, a parasympathetic nerve supply from the bulbar region in addition to its sympathetic nerve supply. 2. Physiologically, Greig pointed out the necessity of considering the esophagus as equivalent to

* Submitted for publication, Nov. 18, 1929.
* Read at the Twelfth Annual Meeting of the American Bronchoscopic Society, San Francisco, July 6, 1929.

1. Jackson: Cardiospasm, in Nelson's Loose-Leaf Living Medicine, New York, T. Nelson & Sons, 1920, vol. 5, chapt. 4, p. 71.

2. Greig: Brit. M. J., September, 1922, p. 470.

other parts of the digestive tract in maintaining constantly a certain degree of tonus. 3. From a pathologic standpoint, a congenital deficiency or primarily the nerve fault involving the sympathetic or parasympathetic nerves, or both, may occur so that the esophagus cannot properly relax. This inability to relax suggested to Hurst [3] the term achalasia, for he regarded this condition as due to a failure in the coordinating mechanism by which the cardiac sphincter usually relaxes as the gullet muscles contract.

Frothingham [4] considered that the muscle fibers of the diaphragm may play an important part, and in his opinion no demonstrable disease of the esophagus is necessary to induce cardiospasm.

Logan Turner [5] considered the term cardiospasm a misnomer.

Friedenwald and Morrison [6] differentiated cardiospasm from spasm of the cardia. Cardiospasm is not only hypertrophy and an unusually strong contraction of the cardia, but there is also a diffuse dilatation of the esophagus. It is most likely to occur in neurotic persons. Spasm of the cardia is a transient condition.

The peristalsis of the esophagus with which every one is familiar is that which follows an act of deglutition (Meltzer [7]). All the movements of the complicated act of deglutition are managed by a reflex mechanism with only one sensory stimulus for its initiation and a series of consecutive motor impulses going to every part of the long path of deglutition; it is practically a single reflex. The reflex mechanism of the secondary peristalsis, on the other hand, consists of a chain of reflexes; each part of the esophagus sends to the center a sensory impulse started by the presence of the bolus in that part and receives in turn a motor impulse. The secondary peristalsis therefore requires the presence of some sort of a bolus within the esophagus and presupposes the integrity of the latter. Whereas the primary peristalsis requires neither a bolus nor the integrity of the esophagus, even if a large section of the latter is removed, the peristalsis appears in the lower segment in due time after each deglutition as long as the vagus nerves remain intact.

The specific contraction of the rabbit's cardia is characteristic; [8] it can even be distinguished from contraction of the adjacent parts of

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3. Hurst, quoted by Thomson, St. Clair: Diseases of the Nose and Throat, ed. 3, New York, D. Appleton & Company.

4. Frothingham, quoted by Cecil: Textbook of Medicine, Philadelphia, W. B. Saunders Company, p. 631.

5. Turner, Logan: Nose, Throat and Ear, ed. 2, New York, William Wood & Company, p. 234.

6. Friedenwald, H., and Morrison, T. N.: South. M. J. **16**:34, 1923.

7. Meltzer, S. J.: Secondary Peristalsis of the Esophagus (Proc. Soc. Exper.), Biol. & Med. **4**:35, 1907.

8. Meltzer, S. J., and Auer, J.: Vagus Reflexes upon Esophagus and Cardia, reprinted from Brit. M. J. **2**:1806 (Dec. 22) 1906.

the esophagus and stomach. The contractions are seen to follow, in the first place, at the end of a peristaltic movement of the esophagus after complete deglutition. They also occur in a characteristic way after stimulation of the peripheral end of one of the vagus nerves. The behavior of the cardia during stimulation depends largely on the strength of the stimulus.

The mass thrown down is detained in the esophagus above the cardia until the contraction of the lower section of the esophagus begins [9] (usually about six or seven seconds after beginning deglutition in human beings). Meltzer [9] stated that in not a single instance was any liquid projected through the cardia into the stomach before the arrival of the peristaltic wave about four seconds (in dogs) after the beginning of the act of deglutition. In anesthetized animals, the first act of deglutition often takes place without being followed by peristalsis. In such an abortive deglutition it is seen how fluid or air is shot down into the esophagus and remains there. If a few such abortive deglutitions followed one another after shorter or longer intervals, the esophagus swelled to a large size, looking like a "sausage," until a peristaltic wave set in and carried the entire mass downward all at once. Direct ocular observation of the thoracic esophagus conveyed to me the impression that in the state of rest, the lower part seems to be tonically more contracted than the upper part, and that the upper part is distinctly more responsive to the changes of respiration than the lower part.

As to the depth in the esophagus reached by the immediately projected mass, this depends on the quantity which is swallowed, on the force with which it is thrown down and probably also on the degree of tonicity of the lower portion of the esophagus. In no case did the liquid swallowed immediately reach even the level of the diaphragm, to say nothing of its shooting or oozing through the cardia into the stomach before the arrival of peristalsis. That with each act of deglutition the swallowed mass should remain for a time within the lower portion of the esophagus must, from a teleologic point of view, appear strange, and might perhaps be brought into causal connection with the "spontaneous" development of such pathologic conditions as dilatation of the esophagus.

A neuromuscular incoordination [10] is the explanation of Rolleston, who called attention to the disease thirty years ago.

Mosher [11] said: "I have never denied that there were cases due to spasm but I have never recognized one. In my cases the x-ray findings and those obtained through the esophagoscope were those of

9. Meltzer, S. J.: J. Exper. Med. **5**:150, 1897.

10 Thomson, St. Clair: Diseases of the Nose and Throat, ed. 3, New York, D. Appleton & Company, p. 649.

11. Mosher, H. P.: Ann. Otol. Rhin. & Laryng. **36**:1127, 1927.

stricture." There were two cases in a series of six that were analyzed, and it was found, both on fluoroscopy and on roentgen examination, that there was an annular stricture of large caliber about an inch above the dome of the diaphragm. This would seem to be the place spoken of in the experimental studies of Meltzer when he said that in the normal esophagus there was a lodgment or a stay of the onward progress of the bolus until peristalsis arrived at that point.

It is conceded likely that the function of Auerbach's plexus is probably to keep the muscle from being too active or contracting into a hard knot.[12] All of these observations (contractions and dilatations due to section of the vagi) have suggested to me the possibility that some of the contracting contraction rings seen in the spasmodic ileus, infantile pyloric stenosis, cardiospasm, etc., are due, not to an excessive nerve stimulation, but to the absence of it. It would seem that because of the difficulty in staining technic the conclusions are unreliable. Certain fibers show up well, while others do not, so that negative observations are always doubtful. Even positive ones may be confusing and subject to different interpretations. Actually, little is known about the function of these plexuses.

Ordinarily, the cardia does not seem able to resist the pressure of even a small column of liquid coming from above.[13] According to Cannon and others, the upper end of the stomach and cardia relaxes as the subject swallows. Cannon, Carlson, Boyd, Pearcy and others have found that the cutting of the vagi of the neck will produce a temporary spasm of the cardia, and it may be that changes in the vagi are responsible for some of the cardiospasms seen in clinical practice. Against this view is the fact that the transient spasm seen after the nerves are cut is generally replaced by marked relaxation of the sphincter. As cardiospasm may be present for many years, thirty or more, it would seem that these reflexes cannot be maintained as long. Also, as one or two dilatations will cure from 60 to 80 per cent of the patients, it appears that the contraction is in the tough submucous coat. Many investigators have considered that a large part of the sphincter of the cardia must be due to the contraction of the diaphragmatic fibers surrounding the lower end of the esophagus. This now seems improbable because it can be seen with the roentgen ray that the sphincter is generally situated 2 cm. below that point. Besides, Schlippe has pointed out that the diaphragm contracts during the process of vomiting and yet food leaves the stomach. Serial roentgenograms of the esophagus taken during vomiting show the cardia remaining open.

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12. Alvarez, W. C.: The Mechanics of the Digestive Tract, ed. 2, New York, Paul B. Hoeber, Inc., 1928.

13. Alvarez (footnote 12, page 90).

Between the circular and the longitudinal muscle,[14] there is a plexus of nerves by means of which a local nerve mechanism is maintained. Intimate connection with the great nerve centers is had by the vagi; in addition, the sympathetic sends fibers to the stomach.

SYMPTOMATOLOGY

A sense of discomfort, which is more or less constant, vaguely referred to the mediastinal region and sometimes extending to the diaphragm, is usually complained of.[1] Actual pain does not occur. There are usually eructations of gas of an unpleasant odor and regurgitation of stale sour food. The general nutrition may be seriously impaired, but in most cases the patients appear fairly well nourished.

According to Vincent, of the Mayo Clinic, apples, popcorn and cold water give the greatest difficulty in their free passage through the esophagus. Shortness of breath after meals, hiccup, and cough are common symptoms. Epigastric pain is common. The sense of obstruction to the downward passage of food may be experienced early and usually without regurgitation. Later, definite regurgitation of food is the rule. Loss of weight is not usual.

The symptoms are of shorter duration in malignant stenosis. Solids rather than liquids occasion distress, and there is an associated cachexia and loss of weight. A differential diagnosis must be made from malignant disease, esophageal stenosis (syphilitic), diverticula and even gallstone colic.

DIAGNOSIS

The diagnosis is made by the roentgenologist[1]; the roentgenogram shows a diffuse dilatation of the esophagus, with a stenosis at the diaphragm, the shadow of the opaque mixture narrowing to an irregular trickle through the abdominal esophagus. To quote from Jackson, a typical esophageal picture is a widely dilated esophagus with a grayish-white, pasty mucosa looking like a furred tongue; as in the case of the latter, the coating cannot be wiped away. At the bottom of the sac is a white "floor" of wrinkled esophageal wall through which a firm resistance of the diaphragm can be felt. Knowing the required direction of the tube (pointing to the anterior superior spine of the left ileum), the examiner searches for the hiatus; when it is found, the resistance to the advance of the esophagoscope is discovered to be no more than normal. The instrument passes into the stomach without resistance. The absence of a growth or an infiltration, such as a cancer, completes the diagnosis. In a true cardiospasm, the roentgenogram is usually sufficiently characteristic, revealing a conical dilatation of the terminal of the esophagus above the cardia.

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14. Osler, William; and McCrae, Thomas: Modern Medicine, Philadelphia, Lea & Febiger, vol. 3, p. 307.

The outline is smooth and symmetrical, as distinguished from carcinoma in which the stenosis is usually well above that point.

A Mosher ballooning esophagoscope facilitates the diagnosis, for by gentle inflation the mucosa can be pushed away from the beak of the instrument, and as one approaches the cardia, the direction of the esophagus and the position of the cardia are more easily made out; even though a spasm is taking place, by again gently ballooning the beak of the instrument, it enters further and eventually reaches the stomach.

In the differential diagnosis, it is essential that one establish the integrity of the mucosa. In cardiospasm, the mucosa may be irritated, congested and coated with a glary mucous of a thick milky-like substance; whereas, of course, in a malignant condition there is a loss of continuity of the mucous membrane by either a new growth or an ulceration of this growth. In diverticulum, diagnosis is positively made by the roentgenogram and would be necessarily of the traction type. The pulsion diverticulum, of course, would be located in the upper part of the esophagus in the cricopharyngeal region and would show by roentgenogram; in esophagoscopy, difficulty would be experienced in entering the lower part of the esophagus. Diseases of the gallbladder and other abdominal conditions might even produce a cardiospasm, reflexly, and the pain might be referred to the epigastric region, but other symptoms such as colic definitely referred to the region of the appendix or gallbladder, roentgenograms definitely showing some lesion in these regions and other gastro-intestinal symptoms would indicate that one was dealing with some condition other than that of a true cardiospasm.

TREATMENT

When the case under consideration is one of so-called cardiospasm, after esophagoscopy has been performed and has confirmed the roentgenographic observations, there is but one treatment that is of real value and that will, in from 60 to 80 per cent of the patients presenting themselves, give more or less permanent relief. I refer to dilatation of the cardia. This dilatation should be at least the size of the upper part of the esophagus and, better, one larger than that. Hydrostatic dilatation, as suggested by Plummer and Vincent, and the suggestion of Mosher of using a barium sulphate mixture instead of water have been used successfully.

The method of procedure is as follows:

With an instrument that is a combination of the Mosher diagnostic barium bougie and the Plummer hydrostatic dilator, the thin barium mixture is introduced into the bag. The proper pressure is maintained by a manometer which should register from 15 to 25 pounds (6.8 to 11.3 Kg.), depending on the character of the case, and the size and the

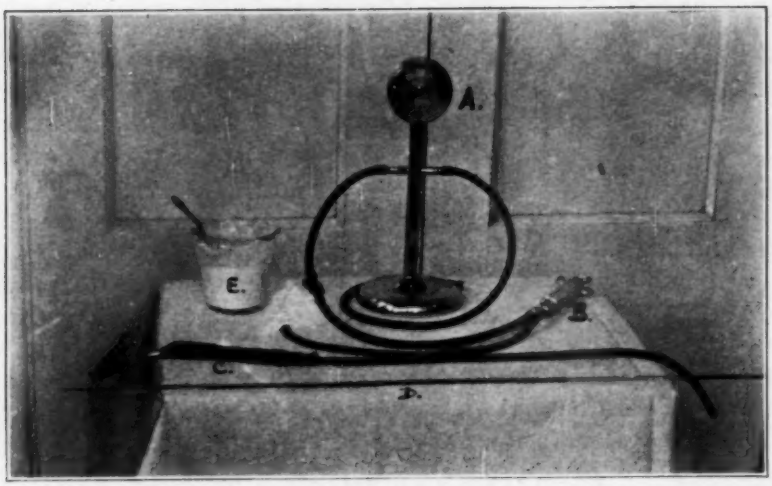

Fig. 1.—*A*, Plummer manometer with radiolite dial; *B*, Potain syringe; *C*, Plummer hydrostatic dilator; *D*, removal stilet (after Mosher) to facilitate the introduction of the dilator; *E*, jar containing barium mixture.

Fig. 2.—Hydrostatic dilator within the cardia, before dilatation.

age of the patient. The method of introduction of the fluid is by a Potain pump, the connections being reversed; that is, instead of aspiration the fluid is introduced and the column is maintained in the tube because of the valve action of the Potain pump. The patient is placed in the fluoroscope, and the Plummer-Mosher instrument is introduced under its guidance. When the hydrostatic bag is seen in the midportion of the cardia, the fluid is pumped into it. This is continued until a pressure of from 18 to 24 pounds (8.2 to 10.9 Kg.) is obtained. There should

Fig. 3.—Dilatation of the cardia, showing the waistlike constriction of the dilator where it is grasped by the cardia.

be a sustained pressure of from two to five minutes. Usually and immediately following the dilatation, burning pain is experienced in the epigastrium. This may persist for several hours or until the next day. During the dilatation, the hydrostatic bag is seen in the cardia with the olive or the flexible tip in the stomach, near the greater curvature, toward the left side of the patient. The general outline of the bag is that of a bulge below, with a tapering to the midportion and a bulge above; in other words, the bag assumes at its midportion a waistlike outline.

This outline depends on the amount of dilatation that the cardia is subjected to. At no time has the bag been seen to be entirely without a constriction of its midportion. After the pressure is maintained for from two to five minutes, the fluid is removed by the releasing of the pump from the tubing of the end of the dilator, and the tube and the bag are removed from the esophagus. Usually, there will be a great deal of glary and viscid mucous withdrawn with the bag. As a rule, roentgenograms taken immediately following this procedure show exactly

Fig. 4.—Dilator within the esophagus; it has slipped out of the cardia. This shows the necessity of proper fluoroscopic supervision of the instrument during dilatation.

the same condition that existed prior to dilatation. These phenomena would appear paradoxic, for these patients are able to eat immediately without the former symptoms, and they gain weight rapidly. If the dilatation is not sufficient, recurrence may be expected to follow immediately, and the dilatation should be repeated within a week or ten days, more pressure being used and the dilatation being sustained somewhat longer.

CONCLUSIONS

The roentgenographic study of the cardia following dilatation would seem to prove that one is dealing, not with a spasm, but with a peculiar disturbance of the nerve endings in the lower end of the esophagus. From a clinical standpoint, Meltzer's laboratory experiments would seem to be sustained.

CHANGES IN THE ESOPHAGUS SECONDARY TO CARDIAC AND AORTIC DISEASES*

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AND
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The importance of changes in the esophagus produced by diseases of the heart and aorta is being recognized more and more by roentgenologists and cardiologists throughout the world. Roentgen examination of the esophagus in such cases is often of considerable value as a diagnostic aid in determining the condition of the heart or

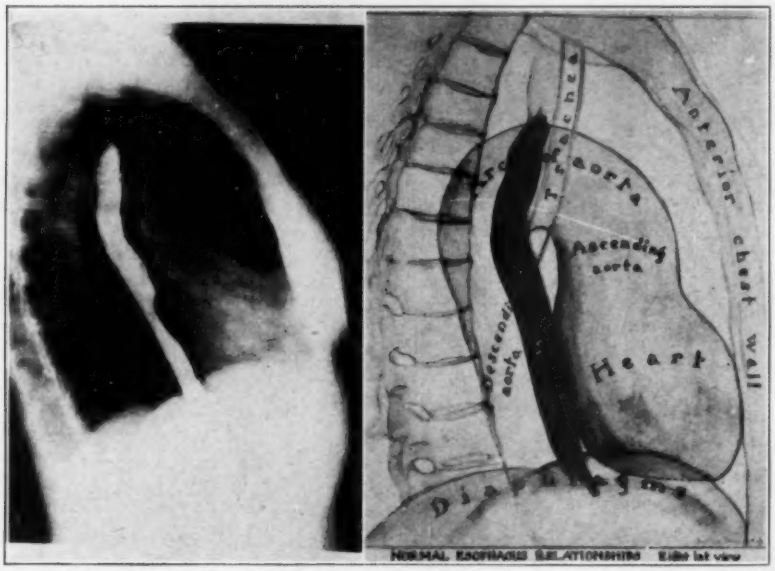

Fig. 1.—*A*, the aortic bed in the esophagus and the cardiac compression are well shown; notice the space between the vertebral column and the lower portion of the esophagus; this is normally occupied by the descending aorta; *B*, the bifurcation of the trachea is not shown.

aorta. Most of these patients have no esophageal symptoms and esophagoscopy is usually contraindicated; still this paper is presented in the belief that it may be of interest and perhaps of some practical value.

The normal relationships of the esophagus to the heart and aorta are shown in figure 1. The diagram is made from the x-ray film to

* Submitted for publication, Nov. 18, 1929.
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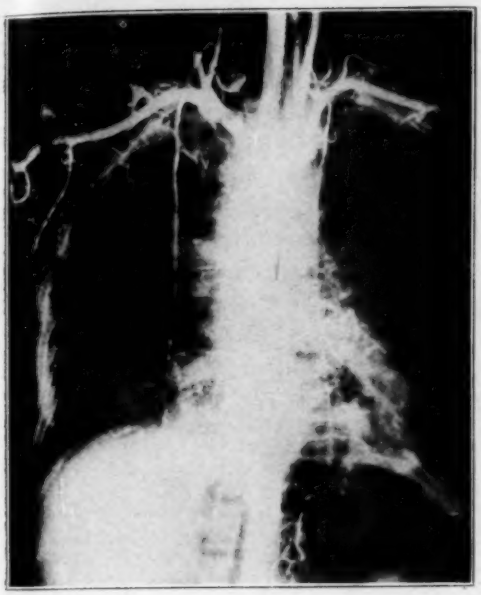

Figure 2.

Figure 3

Fig. 2.—The corrugated tube in the esophagus differentiates that structure from the large blood vessels which have been injected by the embalmer's fluid. Note how the arch of the aorta passes in front of the esophagus and then loops around it so as to descend posteriorly and to the left of it. This is the first time that this plate has been shown (kindness Dr. Rigler).

Fig. 3.—A large aneurysm of the aortic arch. The esophagus is displaced to the right and a sharp kink is made in it; nearly a half circle must be made by food going around the aorta.

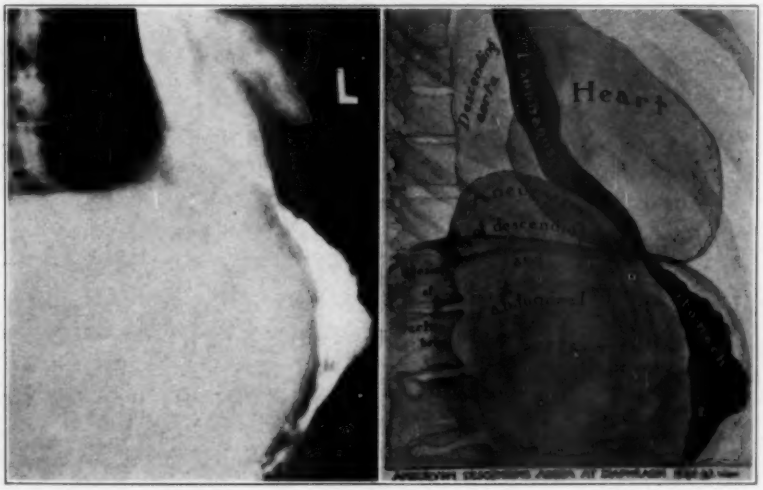

Fig. 4.—A large aneurysm of the descending and abdominal aorta displacing the esophagus anteriorly.

interpret its reading better. The anterior wall of the upper third of the esophagus is crossed by the transverse portion of the arch of the aorta, producing what esophagoscopists know as the aortic narrowing. Just below this is the narrowing produced by the left bronchus. From this point the anterior esophageal wall is in contact with the left auricle of the heart, which extends nearly to the level of the diaphragm, and the left posterior esophageal wall is in contact with the descending aorta till just above the diaphragm the esophagus turns to the left and crosses the aorta; there the right posterior wall is in contact with the aorta. Figure 2 is a plate made of a cadaver after the embalmer has injected the internal carotid artery with a solution of lead oxide. A

Fig. 5.—Marked compression of the esophagus and displacement posteriorly by an enlarged left auricle. Here the esophagus seems to be posterior to the anterior border of the vertebral column. This patient complained of esophageal obstruction.

corrugated tube has been inserted into the esophagus. One can see how the arch of the aorta crosses the esophagus and passes down, as the descending portion, posterior and to the left of the esophagus.

This close anatomic relationship has been taken advantage of by clinicians who have percussed the posterior wall of the heart and auscultated the left auricle by means of tubes and tambours in the esophagus. Rigler [1] noted the infrequency of reference in the roentgen literature to the value of roentgen examination of the esophagus in

1. Rigler: Visualized Esophagus in the Diagnosis of Diseases of Heart and Aorta, Am. J. Roentgenol. **21**:563, 1929.

cardiac cases. He discussed the technic of making the roentgen examination, together with its value to the cardiologist as a diagnostic aid. From the standpoint of endoscopy his conclusions may be given as follows:

1. Dilatation of the aortic arch will produce a deviation of the esophagus to the right, posteriorly with compression (fig. 3).

2. Dilatation of the descending aorta displaces the esophagus anteriorly and produces compression; if in the proximal there-fourths, the esophagus is displaced to the right and if in the distal fourth, it may be displaced to the left (fig. 4).

3. Dilatation of the left auricle compresses the esophagus and displaces it posteriorly (fig. 5). That cardiac enlargement is a cause of esophageal obstruction is not commonly mentioned in the literature on the esophagus. In Abel's new book on esophageal obstruction, for instance, this fact is not mentioned. Of course, patients with hearts dilated sufficiently to produce esophageal compression are usually so sick that they do not complain much of their esophageal symptoms.

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PULMONARY ABSCESS FOLLOWING TONSILLECTOMY

BRONCHOSCOPIC CONSIDERATIONS *

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The increasing number of reports of successful treatment by bronchoscopy in cases of pulmonary abscess confirms the observations of the earlier bronchoscopists regarding the wisdom of improving drainage by way of the natural channels. Experiences at the bronchoscopic clinics have convinced the bronchoscopist, as well as the internists, roentgenologists and surgeons who see the cases of abscess of the lung in consultation, that in a majority of instances bronchoscopy should be given a trial unless definitely contraindicated.

Since reporting on certain observations and results [1] in a group of cases, additional patients with abscess of the lung have come under my care, so that now a series of seventy-seven cases is reviewed.

OBSERVATIONS

The curious frequency of occurrence of pulmonary abscess complicating tonsillectomy in early adult life remains unchanged. Of the seventy-seven cases, fifty (65 per cent) occurred in patients between the ages of 20 and 40. This corresponds rather closely to the age-abscess incidence of pulmonary abscess from all cases, as shown by Flick and his co-workers.[2] In their report on a series of 172 cases of abscess complicating operations, respiratory infections and other conditions, 58.7 per cent occurred in patients between 20 and 40.

Anesthesia.—In four cases, local anesthetic was used; in seventy-three, general anesthesia (table 1). This is of significance when it is recalled that local anesthesia is more often employed for tonsillectomy during the third and fourth decades, and it is among patients in this period of life that abscess most commonly occurs.

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* Read at the Twelfth Annual Meeting of the American Bronchoscopic Society, San Francisco, July 6, 1929.

1. Clerf, Louis H.: Lung Abscess Following Tonsillectomy, Atlantic M. J. **31**:911 (Sept.) 1928.

2. Flick, J. B.; Clerf, L. H.; Funk, E. H., and Farrell, J. T.: Pulmonary Abscess, Tr. Am. A. Thoracic Surgeons, 1929; Arch. Surg. **19**:1292 (Dec.) 1929.

Lobar Distribution.—The present observations conform with those of the majority of writers so far as involvement of the right lung is concerned. In forty-eight cases (62 per cent) the right lung was involved, while in twenty-eight (37 per cent) the abscess occurred in the left lung; in one the lesion was bilateral. In lobar involvement, however, the distribution is at variance with the observations of many observers. As will be noted in table 2, an upper lobe was the site of

TABLE 1.—*Frequency of Pulmonary Abscess Complicating Tonsillectomy*

Decade of Life	Per Cent
First	10
Second	16
Third	37
Fourth	28
Fifth	7
After fifth	1
Sex:	
Males	53.2
Females	46.8
Anesthesia:	
Local	4 cases
General	73 cases

TABLE 2.—*Lobar Distribution of Abscess*

Monolobar lesions:	
Right upper	23
Middle	2
Right lower	13
Left upper	13
Left lower	11
Total	62
Multilobar lesions:	
Right upper and middle	3
Middle and right lower	7
Left upper and left lower	4
Right upper and middle and left upper	1
Total	15

the lesion in thirty-six cases (46.7 per cent). With the middle lobe included as a part of the right upper lobe, the number of cases in which the upper lobes are involved is forty-two (54.5 per cent). The cause of this statistical discrepancy is not apparent. In this group, localization of the lesion was based on physical examination, roentgen study and bronchoscopic observations, and represents the most accurate method that can possibly be employed in the living subject without resorting to surgical exploration. One is often impressed with the difficulty in ascertaining the lobar distribution of a deep-seated abscess by physical examination alone. Usually after a complete study one can be certain of the lobe involved.

DIAGNOSIS

A history of tonsillectomy followed by symptoms and signs of a suppurating process in the lung is suggestive of postoperative pulmonary abscess. As frequently pointed out by Jackson, Yankauer, Patterson, Imperatori and others, the presence of a bronchial foreign body must be considered and ruled out. Other bronchial lesions may be present and may not manifest symptoms until some time after a tonsillectomy or other operation has been done. The following case is illustrative:

Fig. 1.—The pathologic process involving the root area of the right lung is extensive; the outlines are so sharply defined that if of infectious origin the process must be of long duration. Dr. W. F. Manges expressed his belief that the lesion may be a new growth which is probably encapsulated rather than infiltrating (roentgenogram by Dr. Manges).

A man, aged 36, who had had sore throat and was below par physically, was advised to have the tonsils removed. Tonsillectomy was performed under general anesthesia. Convalescence from the operation was delayed. Within three weeks after operation there developed an unproductive cough with pain in the right side of the chest. In a few days pus, at times blood-stained, was expectorated. A diagnosis of abscess of the lung complicating tonsillectomy was made and appropriate medical treatment was instituted. For about one month no improvement was noted, and the patient was referred to the Bronchoscopic Clinic for treatment. Dr. E. H. Funk's observations by physical examination indicated a well localized lesion in the right lung and were suggestive of abscess although new growth could not be ruled out. Bronchoscopy was indicated. The roentgen

studies were reported by Dr. W. F. Manges (fig. 1). At bronchoscopy there was found a stenosis of the right bronchus produced by a neoplasm. A specimen was removed for histologic examination. Dr. B. L. Crawford's report was carcinoma.

Without a diagnostic bronchoscopy in this case, the diagnosis would probably have been abscess of the lung until surgical intervention or metastasis of the growth would have furnished the necessary additional information.

TREATMENT

The underlying principles in the treatment for pulmonary abscess, irrespective of the method to be employed, consist of establishing and maintaining adequate drainage. There are other considerations, but this one is fundamental. If this can be accomplished, under a regimen of rest and postural drainage combined with symptomatic measures, no other forms of treatment are indicated; if drainage cannot be adequately maintained, additional aids are necessary.

Bronchoscopy, in safe hands, is generally admitted to be an aid in the conservative form of treatment in contradistinction to external drainage, the more radical form. When should bronchoscopic treatment be instituted? There is considerable difference of opinion with regard to this question. Some writers favor treatment early in the course of the disease, while others advocate delay to determine whether the patient will recover under medical treatment alone. The latter plan may be of controversial interest in ascertaining the number of cases of pulmonary abscess in which the patient will recover spontaneously. It affords little comfort, however, to the patient who does not recover and whose case must now be classed as chronic. Bronchoscopy is indicated if drainage is impaired. It may be difficult to decide whether the symptoms in a given case are due to an extension of the suppurative process or to interference with drainage. Here it is important to have the counsel of the internist and the roentgenologist. Fever is no contraindication to bronchoscopy; often, following one or two aspirations, the temperature will return to normal (figs. 2 and 3).

It has been the practice at the Chevalier Jackson bronchoscopic clinics to institute bronchoscopy early in the course of the disease. It must be recalled that a majority of the patients referred to the clinic have been under medical treatment for variable periods of time, and, owing to little or no improvement, it was concluded that bronchoscopy was indicated. If external surgical drainage is indicated, a diagnostic bronchoscopy only is performed. Occasionally there is no apparent indication for bronchoscopy, and the patient is continued under medical treatment. The patients are under the supervision of the internist, and the surgeon is called in consultation to determine whether bronchoscopy

should be continued or whether surgical measures are indicated. Frequent roentgen examinations are made.

No definite rules can be laid down with regard to the length of time that bronchoscopy should be continued before external drainage is employed. Often, patients will not submit to an operation.

Prolonged duration of a pulmonary abscess is not necessarily a contraindication to bronchoscopy. In six of the cases in this group, the duration of the abscess was longer than one year. Of these patients, five recovered under medical and bronchoscopic treatment (fig. 4); one

Fig. 2.—On the tenth day following tonsillectomy under general anesthesia, a boy, aged 10, developed fever and cough; later a large quantity of fetid pus was expectorated. Dr. W. F. Manges reported from the roentgenogram that an abscess was present in the lower portion of the right upper lobe which extended from the root area to the lateral chest wall. There was an irregular cavity in the interior of the dense area with a large amount of exudate throughout the lung tissue in this area. Fever and cough with expectoration continued. Bronchoscopy was performed five weeks after the onset of symptoms.

case was referred to the surgeon. Every case must be considered individually; in this connection, it is important to emphasize again the need of frequent consultation between the internist, surgeon, roentgenologist and bronchoscopist to determine the best form of treatment. Frequent examination of the patient by the surgeon is important, even if operation is not contemplated.

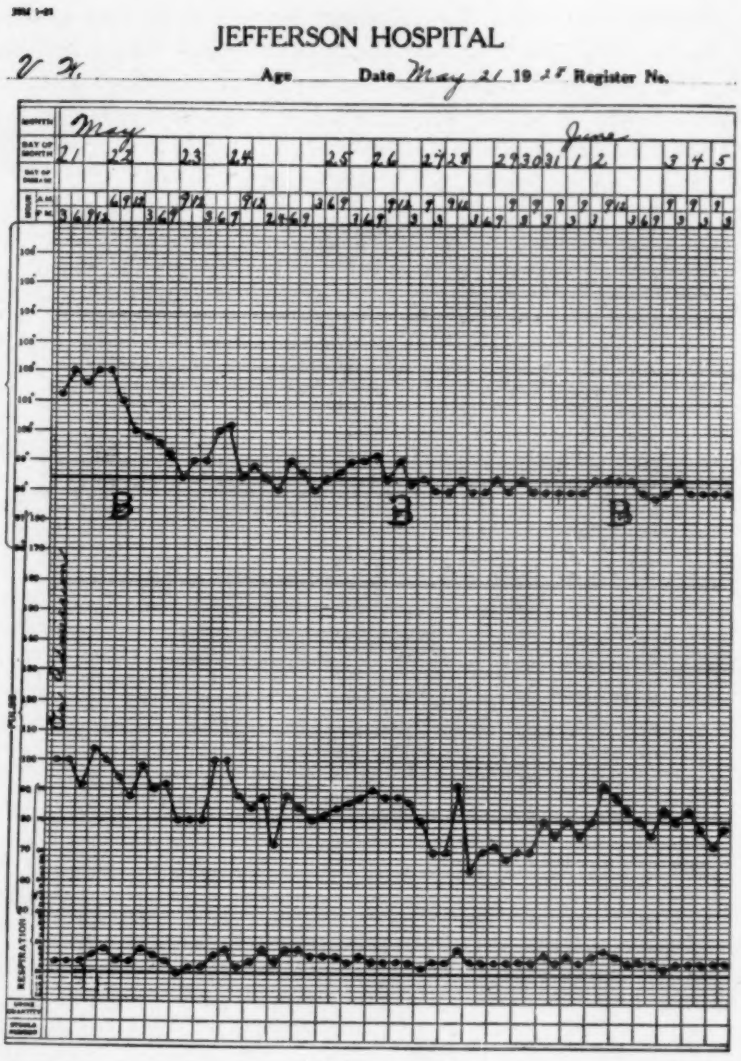

Fig. 3.—Following bronchoscopy (*B*) in patient shown in figure 2, the temperature dropped to normal and remained at that level. Although there was a marked decrease in cough and expectoration, bronchoscopic aspiration was continued. Six bronchoscopic aspirations were performed over a period of seven weeks. At the end of this time the patient was free from all symptoms, no abnormal physical signs were elicited and the roentgen studies failed to reveal any abnormal observations. When last observed, over one year after the last bronchoscopy, the patient was well.

A brief summary of the results of treatment in the series of seventy-seven cases appears in table 3. Thirty-eight patients were ultimately discharged as well after a course of bronchoscopic treatment. The average duration of the abscess before treatment was instituted was four and one-half months. In twenty-seven cases, the duration was three months or less; in five cases it was more than one year. The average number of bronchoscopic treatments in the thirty-eight cases was sixteen.

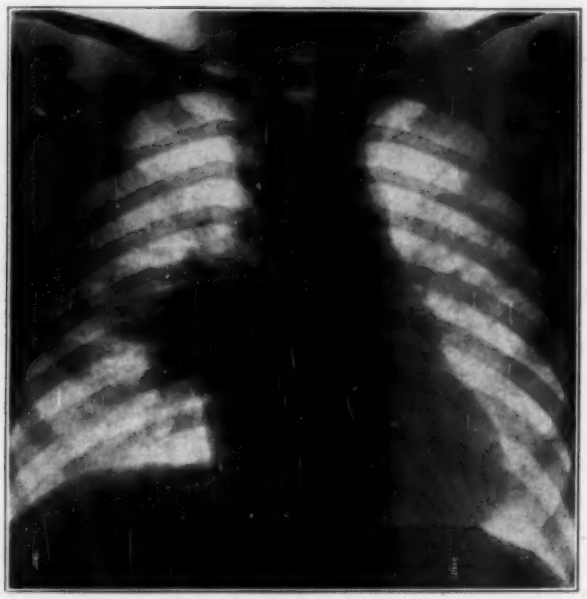

Fig. 4.—A roentgenogram of a boy, aged 9, who had developed an abscess of the right lung following tonsillectomy fourteen months before. For more than one year he had been receiving medical treatment for a chronic cough associated with expectoration of a small quantity of fetid pus. At times there was fever. The patient was pale and underweight; the breath was fetid. There was slight clubbing of the fingertips. The abscess involved the hilus of the right lung and extended into the upper portion of the middle lobe as well as the lower part of the right upper lobe. Bronchoscopic treatment, which was instituted fourteen months after the development of pulmonary symptoms, was continued over a period of two years; a total of thirty-eight treatments was given. Since the last treatment, which was given three and one-half years ago, the patient has been frequently observed; there has been no recurrence of the suppurating process and he appears well (roentgenogram by Dr. W. F. Manges).

In the six cases listed as unimproved, the patients either refused to continue with bronchoscopic treatment, did not return for continuation of treatment or were referred to the surgeon but refused to submit to operation.

Eighteen cases were referred to the surgeon after a brief course of bronchoscopy. The average duration of the infection, before bronchoscopy was instituted, was seven months. In eleven cases the duration was three months or less; in one case it was more than one year. In fifteen cases an average of seven bronchoscopic aspirations was carried out before being referred to the surgeon. In two cases, there was a reinfection after the patients had been discharged from the hospital. In one case, bronchoscopy was carried out in conjunction with surgical intervention.

TABLE 3.—*Results After Bronchoscopic Treatment*

Patient	No.
Well	38
Improved	7
Unimproved	6
Referred to surgeon	18
Died	3
Under treatment	5

CONCLUSIONS

1. Bronchoscopy is indicated as a diagnostic measure in every case of pulmonary abscess in which there is a question in diagnosis.

2. Bronchoscopic aspiration, as a part of the conservative form of treatment, should be instituted early in the disease unless contraindicated; in the hands of an experienced bronchoscopist contraindications are few.

3. No definite rules can be laid down with regard to the length of time bronchoscopy should be continued; every case of abscess of the lung should be individually considered by the internist, roentgenologist, surgeon and bronchoscopist to determine the form of treatment to be employed.

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PULMONARY ABSCESS FOLLOWING TONSILLECTOMY

LARYNGOLOGIC ASPECT *

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The literature concerning infection of the lung following operative procedures has increased much more rapidly since the bronchoscope has become a recognized instrument of diagnosis as well as of treatment.

Postoperative pneumonias such as those seen a decade or two ago are not frequently seen today, which may be due partly to increased knowledge and to improved technic in administering anesthetics, although to my mind this is not all.

The necessity of the respiratory tract to life was known in ancient times, for the first that one reads of man as a living creature relates to his breath: "And the Lord God formed man of the dust of the ground, and breathed into his nostrils the breath of life, and man became a living soul."

At what period in the development of medical knowledge was infection of the lung recognized as being derived from the upper respiratory tract? Aristotle (384-322 B. C.) apparently knew the route taken by the air from the nostrils to the lungs, for he described the larynx as the organ through which the voice and breath pass. He furthermore described the trachea and its cartilaginous rings, and said that if liquid is drawn into it, it is expelled through the nostrils. He described the epiglottis as that organ which covers the larynx, but which is supposed to be a part of the tongue. He also believed that voice production was due to the air column in the trachea coming in contact with laryngeal structures.

Both Galen and Paulus Aegineta warned their readers against removing too much tonsil because of the possibility of injuring the voice and causing inflammation of the lungs. From this one has refutation of the arguments of the advocates of both local and general anesthesia, because they used neither. Joannides gave Hippocrates credit, but the reference was incomplete. While they probably did not recognize abscesses of the lung, they knew much of the technic that is used today, and would possibly have equaled workers of today if they had had modern facilities. This statement applies almost equally to immediate preroentgenologic and prebronchoscopic medical

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* Read at the Twelfth Annual Meeting of the American Bronchoscopic Society, San Francisco, July 6, 1929.

practice. Textbooks on diseases of the nose and throat give little attention to this subject. McKenzie gave only the following:

> Recently, in America, attention has been drawn to the occurrence of the highly dangerous complication of pulmonary abscess and gangrene after tonsillectomy. All cases recorded have been adults, in most of whom general anaesthesia had been employed. The pulmonary infection is attributed, not to aspiration during operation, but to infective emboli from a septic throat wound, and stress is laid upon faulty technique, with slow operating and unnecessary crushing of tissues, as the chief predisposing cause.

This is the opinion of America's best friend in Europe, one who is familiar with and gives credit to our workers whenever deserved, but it is, one must admit, very meager considering the importance of the subject. McCrae gave the following, which was abstracted from Osler:

> Suppuration appears in the lungs under the following conditions: (1) As a sequence of inflammation, either lobar or lobular. In lobar pneumonia the abscesses are small and usually involve, as Addison remarked, several points at the same time. Abscess formation is frequent in the deglutition and aspiration forms of brochopneumonia. (2) After wounds of the neck or operations on the throat, particularly the tonsils, in suppurative disease of the nose or larynx, occasionally of the ear, infective particles reach the bronchi and excite inflammation which often ends in abscess. Abscess of the lung after tonsillectomy occurs with alarming frequency. Moore, as the result of a careful study, estimated its occurrence as one in from 2,500 to 3,000 tonsillectomies, which is probably conservative. The abscess may follow inspiration, as suggested by the fact that 60 per cent are in the lower lobe (41 per cent in the right lung and 19 per cent in the left lung in Moore's series of 202 cases). Others hold that embolism is the chief cause; emboli lodge in the right lung more often than in the left.

THEORIES OF ORIGIN

In favor of the embolic theory, one must note the cases of abscess of the brain as well as of the lung, reported by Bevan following tonsillectomy.

While one cannot deny the possibility of the occasional embolic transference of septic material from the mouth, nose or throat to the lungs, it is certainly unusual. When one considers the number of foreign bodies which gain entrance to the bronchi during waking hours, and the entrance of fluids into the trachea during consciousness when the laryngeal reflexes are active, it seems entirely reasonable that infectious material which may be macroscopic or microscopic is probably, if not constantly, passing these barriers during anesthesia when these reflexes are partially or wholly abolished. It is only to be considered miraculous that it does not happen more frequently.

Lynah examined tracheotomized patients after tonsillectomy and found blood in the trachea in all cases. Myerson performed bron-

choscopy in a large series (200) of otherwise normal children, in 155 of whom he found blood in the trachea.

Any patient who is operated on under a general anesthetic, in whose upper respiratory or digestive tract septic material is present, is a potential case of lung abscess, while in those cases in which the operative field is in the mouth, nose or pharynx one may add the possibility that blood clots carry the infection.

The origin of the infection has been a bone of contention since Richardson first called attention to the subject, and whether the solution is nearer at present is a question. Observation would lead one to the conclusion that no one source or one lesion is responsible for all cases, because there would be many more cases. Most likely injury is produced by one organism, or its toxins, and another symbiotic organism produces suppuration; or a lodgment in or production of an atelectatic area favors growth of the suppurative organism on a field normally well ventilated. Thus deprived of air, but irritated by saprophytic organisms or enzymes produced by changed dead tissue (blood clot) the organism receives no nutriment from the living organism. Experimental as well as practical evidence can be found in the current literature, and recently experiments have been carried on abroad, especially by Ascoli, which corroborate the aspiratory theory.

Ascoli spoke of his work as "experimental postoperative bronchopulmonitis." From this second series of researches (on dogs) he concluded that in normal lungs it is possible to provoke inflammations of a mild type that tend to resolve and do not give rise to septicemia, even with a strain of pneumococcus of low virulence. The quantity of broth culture injected into the respiratory passages must always be about 20 cc.; it must be injected directly into the bronchi with a sound introduced through the natural passages. The author felt justified in affirming also that while it is possible with a slightly virulent pneumococcus to produce mild inflammations of the lungs of normal dogs by the use of a definite technic and a definite quantity of septic material, it is not possible by injecting a smaller quantity of broth culture directly into the trachea through the skin. Four controls thus treated all showed normal lungs. However, dogs subjected to simple gastro-enterostomy showed, in three of eight cases, pulmonary lesions comparable to those obtained by American investigators.

While it is known that the epiglottis does not cover the larynx during deglutition, but with the assistance of the base of the tongue forces the bolus into the sides of the pharynx, and that food and foreign bodies do not gain entrance to the larynx, even when the epiglottis is destroyed by disease, nevertheless, during operations on the throat and mouth the pressure on the base of the tongue has a tendency to keep

the epiglottis upright and the larynx open but slightly narrowed on account of the tension on the aryepiglottic folds and ventricular bands.

The size of the lumen of the larynx may be a factor, as abscess is not often seen in women or in children.

Taking this with the fact that during general anesthesia the reflexes are abolished in whole or in part, foreign substances, especially blood, can readily gain entrance to the trachea and bronchi, and possibly to the alveoli. The pulling forward of the tongue by the anesthetist may be a contributing factor in operations in other fields. It must be borne in mind that the action of the cilia will probably also be inhibited.

The same condition is present, to a great extent, in using local anesthetics when morphine is given by the operator before administration of the local anesthetic, and the cough reflex is abolished.

While it is granted that there may be embolic abscess, the province of the laryngeal reflexes is to prevent aspiratory abscess; while one must admit that due to the aforementioned reasons substances may and do lodge in the pulmonary area, abscess does not occur unless these substances remain in contact with the tissues long enough to allow penetration.

What other factors must be considered? To use modern slang, one might say, "When is an abscess?" In other words, what constitutes the first stage of the inflammatory reaction? Is there a true pneumonia, or do the bacteria which lodge on the mucosa later penetrate the deeper tissues, as suggested by Frederich in 1900; or is a massive atelectasis or a lobar atelectasis the first stage? I believe that it is possible for abscess to begin in several different ways, depending on whether the tissues are injured by mechanical or chemical means, or by chemical change in the tissues. Isabella Herb quoted Dresser as proving that ether may be concentrated as high as 34 per cent, while 7 per cent is as high as can be given without irritation.

Kline and Berger said that while abscess and gangrene are separate entities, they are almost universally treated as one disease. Furthermore, they can be differentiated by careful examination of the sputum.

Another factor may be the splinting of the diaphragm in cases of abdominal operations, when the patient refuses to inspire deeply because of pain, or the lessening of the act of deglutition following tonsillectomy because of pain. The latter condition may also allow saliva to trickle into the larynx, especially in those cases of prolonged action of morphine or of the anesthetic.

Whether infection takes place depends not only on the kind of infection, but also on the type of pathology, as brought out by Joannides and by Kline and Berger.

True abscess is caused by the pneumococcus, or by the *viridans* or hemolytic type, while gangrene was caused by the fusospirochaetae.

That anaerobic bacteria were found by Pilot and Davis is proof that a plugged bronchus frequently occurs.

Compression of the bronchus by a large peribronchial gland, as reported by me, may be a cause of lobular or even lobar collapse. This occurred in one of the bronchoscopic cases; the bronchus showed collapse, although other bronchi contained plugs. It required treatment with medical diathermy to clear the lungs completely.

The origin of the infection may be from a sinus infection. In six patients with massive collapse seen by me in the last year, five had infected sinuses; the sixth was not examined roentgenologically.

The putrid odor of the inspirated plugs from tonsils is most frequently due to spirochetal infection; this is true of the pus from pyorrheal pockets and from mouths in which the teeth are covered with deposits of calculus.

AURAL THERMOMETRY AS A DIAGNOSTIC AID IN OTOLOGY

PRELIMINARY REPORT *

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It will not be amiss to review cursorily the pathology of inflammation in general and then to consider it as it obtains in the practice of otology.

The four cardinal symptoms of inflammation, known since the time of Galen, are calor, rubor, dolor and tumor. To these is added a fifth, namely, lost or altered function.

Calor, or increased heat in the inflammatory zone, is due to active hyperemia with its consequent increased metabolic rate. This is a constant objective sign in all acute inflammations. It may also be a subjective symptom, for the patient may appreciate increased heat in the part, but more often it is indistinguishable from the sensation of pain. This can be ascertained in accessible regions, by the examiner touching the part or by means of a thermometer held between the affected area and the examiner's finger, and by the repetition of the process over normal tissue for the sake of comparison. The general bodily temperature is apt to be raised if the inflammation is extensive or deep seated, but since this paper is concerned only with local thermometry, I shall dismiss that phase of the subject for the time being.

Dolor, or pain, is a subjective symptom that in inconstant, depending on the part affected. It is the result of the inflammatory products causing pressure on the sensory nerve endings or by the bacterial toxins irritating the nerve endings.

Rubor, or redness, is brought about by the increased circulation in the diseased area, with its consequent stagnation.

Tumor, or increased size of the affected zone, is caused by the distention of the site of inflammation by the increased blood supply, exudates and migratory cells attracted to the lesion by chemotaxis.

Lost or modified function in the part is due to all or any of the causes enumerated and may be subjective and objective.

It is on the presence of one or all of the signs cited that diagnoses are based. It is indeed fortunate, from a diagnostic standpoint, that all of these signs are coexistent and pronounced. In the majority of cases, one has to make a diagnosis on one or more of them.

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In acute processes of the ear, one likewise forms a decision as to the nature of the disease by observation of the local and constitutional symptoms.

In a typical case, a patient presents himself complaining of pain in the ear with impairment of hearing. Here are two of the classic symptoms of inflammation, but one cannot yet arrive at a diagnosis. The condition may be due to an involvement of the external, middle or even the internal ear. By further questioning the patient as to the time of onset, location, intensity, etc., one gets nearer the truth but cannot yet rule out certain of the possible conditions. Physical examination by means of the visual and tactual senses is next resorted to. Edema, tenderness, or redness in or around the mastoid, auricle or canal are not found, but one does find the drum membrane red and bulging. So that by a complete examination one has elicited four of the cardinal signs, namely, rubor, dolor, tumor and altered function. These are sufficient for the purpose of making a diagnosis of otitis media purulenta acuta. Yet the one sign is lacking which would make this a truly typical case, namely, calor, and from the premises one knows that it is surely there.

It is true that in this particular case the diagnosis is fully established, and to ascertain the presence of increased temperature, by means presently to be described, is of academic significance only, but in cases that are not so clearly defined it may render valuable data as to both diagnosis and prognosis.

The method is based on the established principle that in all active inflammatory conditions there is of necessity a rise of temperature in the immediate zone of the active lesion, and one could accurately measure it, provided the part is accessible and the instruments sensitive enough.

DESCRIPTION OF INSTRUMENT AND THE TECHNIC OF ITS APPLICATION

The thermometer used for this purpose is the rectal type with rather a large mercury chamber or, better still, the oral type that has been on the market for some time and advertised as "unbreakable," the bulb of which is a direct enlargement of the stem wthout being separated from it by a necklike constriction. These thermometers or the rectal ones have a circumference at the bulb of about 17 or 18 mm., French scale. These instruments are sufficient to take the aural temperature in the great majority of cases. For patients with wide canal walls, I use an instrument with a bulb 19 or even 20, 22 or 24 mm. in circumference, made up especially for me.

After the canal of the ear is cleaned of discharge or cerumen, the instrument (the mercury of which has been shaken down to 95 or below) is introduced as far as it will go into the meatus, the bulb being

directed toward the drum, until its sides rest snugly against the sides of the canal. By exerting gentle pressure on the stem, sufficient to retain the instrument in the canal, an air-tight chamber is formed between the thermometer and the drum.

Great care must be exercised not to exert undue pressure on the instrument to obtain occlusion of the canal; one must depend rather on the proper relation of size between the instrument and the walls of the canal. Although it is desirable to approach the drum as closely as possible, on no account shall the instrument be made to rest on the drum by using too narrow a bulb. Nor shall one chose too large a bulb, for by so doing the test will be vitiated on account of the bulb being too far from the drum and hence too far from the site to be tested.

In a person with normal temperature and no lesion of the ear, if the instrument is used in the manner described, it will be found that the aural temperature will register within 1 degree of the oral temperature. Any acute pathologic condition in the aural tract whereby heat is generated locally will by continuity of structure or by conduction be diffused to surrounding parts. In this method of thermometry, the surrounding tissues directly and the air chamber will affect the mercury, and it will register a degree of temperature equaling or exceeding that of the oral temperature.

Thus, in a person with an oral temperature of 98 and with no acute condition of the ear, the aural temperature will register 97+. In diseases other than those of otitic origin, the aural temperature will follow the oral temperature *pari passu* to within 1 degree. If a patient has a temperature by mouth of 100, he will show 99+ by ear; if the temperature is 105 orally, it will be 104+ aurally, etc.

In acute diseases of the ear with or without constitutional pyrexia, the temperature by ear will equal or exceed that registered by mouth. From the foregoing statements, one may deduce the following formula: Whenever the aural temperature equals or exceeds the oral temperature, irrespective of the normality or abnormality of the latter, one is dealing with an active pathologic process in the ear tract.

In using this method, one should not neglect to take the temperature binaurally so as to compare one ear with the other and both with that of the mouth.

It is practical in testing to watch the stem of the instrument and note the ascent of the mercury, for in so doing one can best judge whether the instrument is properly inserted. If the mercury does not show a rise after the position of the bulb has been slightly shifted and kept in place for a while, one may withdraw the instrument, for it has registered to capacity. It should also be remembered that it takes a

little longer for the instrument to register to capacity aurally than by mouth or rectum, and therefore it should be left in the ear about a minute longer than in the mouth or the rectum.

ILLUSTRATIVE CASE REPORTS

CASE 1.—I saw A. G., aged 2 years, on Nov. 27, 1928. The child cried a great deal the night before I was called, complaining of pain in the right ear. The rectal temperature was 102 F.; the aural temperature was 100.2 F. in the left ear and 101.3 F. in the right. When the drums were examined, the left was normal and the right, red and bulging. Incision was followed by a sanguineous discharge. Next day there was a slight purulent discharge, from the right ear, though no pain or tenderness was present in or around the ear. The rectal temperature was 99 F. and the aural temperature 97.4 F. in the left ear and 97.6 F. in the right. The mother called me up the next day saying that the child had no fever and was doing quite well. Ten days later, the child developed a high fever. The mother stated that the discharge ceased completely three days ago, and that the child was doing well up to the previous night. On examination the left ear was normal and the right ear showed no pain, tenderness or edema in or about the ear; the canal was dry, the drum slightly pinkish and the incision closed. The rectal temperature was 104 F.; the aural, 102.5 F. in the left ear and 102.5 F. in the right. Since thermometry in neither ear indicated any pathologic change, I told the mother to give the child a brisk cathartic and to notify me again the same evening. The temperature dropped to 101 F. the same afternoon and was normal the next morning and remained so.

In this case, the aural temperature relieved me of much anxiety concerning the child's aural condition.

CASE 2.—E. K., a boy, aged 16 years, came to the office on Jan. 3, 1929. He complained of pain in the left ear of two days' duration. Examination revealed a normal right drum. The left showed redness over Shrapnell's membrane and adjacent parts; the rest of the drum was a dull gray and was distinctly bulging, with loss of all landmarks. The oral temperature was 98.7 F. and the aural, in the right ear, 98.4 F. and 99 F. in the left. I advised myringotomy which the patient refused. On January 17, he came again to the office. Examination revealed no edema, discoloration or tenderness over the mastoid, but a profuse, thick, purulent discharge from the left year. The right drum was normal. The left drum was soggy and had a large central perforation. The oral temperature was 99.2 F. and the aural, 98.6 F. in the right ear and 99 F. in the left. After five days, during which time he was instructed to irrigate the canal with copious quantities of boric acid solution, he presented himself again. The discharge had almost subsided, and the perforation in the drum was much smaller. The oral temperature was 99 F.; the aural was 98.4 F. in the right ear and 98.4 F. in the left. He made an uneventful recovery.

CASE 3.—A submucous resection was performed on Mrs. H. S., aged 32, on Jan. 10, 1928. Three days later she experienced pain in the right ear and later in the day noticed a discharge from the same ear. One week after the appearance of the symptoms, she came to my office. On examination, the left ear was normal, while the right ear showed a purulent discharge and the drum was injected and slightly bulging. There was no pain, but tenderness was present over the mastoid. The oral temperature was 99.6 F.; the aural, 99 F. in the left ear and 99.7 F. in the right. A diagnosis of acute mastoiditis was made and the patient referred

to the hospital for operation. A report from the hospital stated that there had been extensive bone destruction. The patient made a rapid recovery.

CASE 4.—S. D., a man, aged 23, presented himself complaining of pain and a discharge from the left ear of three days' duration. The drum was reddened posteriorly and showed a slight fulness and a small perforation in the anterior inferior quadrant. No edema, redness or tenderness was present over the mastoid. The oral temperature was 100.6 F.; the aural, 99.5 F. in the right ear and 100.1 F. in the left, showing a local process subsiding in spite of what appeared at first sight as inadequate drainage. The patient made an uneventful recovery.

Incidentally, I might mention that aural thermometry may be resorted to in case a person is in a comatose state and other sites for thermometry are not conveniently accessible, or in those rare cases of malingering in which the subject simulates fever by exerting friction on the thermometer bulb.

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Clinical Notes

DISKS IN THE ESOPHAGUS*

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Of all the foreign bodies occurring in the respiratory and upper digestive tracts, the commonest form is the disk. Of a total of 213 foreign bodies removed at the bronchoscopic clinic of the Eye and Ear Hospital of Los Angeles, 47, or 22 per cent, were disk-shaped. These were divided in the following order: 15 pennies, or 28 per cent; 12 nickels, or 27 per cent; 1 quarter; 1 half dollar; 6 metal slugs from electrical fuse boxes, or 15 per cent; 1 Chinese coin; 1 advertising token; 1 washer; 1 Mah Jong counter; 1 roofing disk; 1 lead disk; 5 buttons and a brass disk which was part of a toy whistle. With one exception, all of these disks were arrested in the esophagus; the exception, being only half a button and therefore not a complete disk, was removed from the respiratory tract.

The smallest disks were the pennies. It seemed rather surprising that there were no dimes, particularly as the dime is but slightly smaller than the penny, being 18 mm. in diameter, while the penny is 19 mm. in diameter. No available information is at hand to show in what numbers dimes have been swallowed. For some reason, they are not retained. There were two cases in which two coins had been swallowed: in one case the patient had swallowed two pennies, and in another, both a dime and a nickel, the dime being spontaneously extruded, while the nickel required peroral removal.

A disk may lie in the esophagus for a considerable period of time and cause but few symptoms. The early symptoms caused by entrance of the intruder are gagging and occasional coughing. As the esophagus becomes more tolerant, the symptoms largely subside, but there are usually gagging attempts from time to time. Swallowing is often but slightly disturbed, although a large bolus usually does not pass. As the foreign body lies in the folds of the esophageal mucosa, inflammation and swelling gradually develop. Food and débris gather about the coin, and an esophageal infection is set up. There may be necrosis of the esophageal mucosa, and at this stage there may be symptoms of general sepsis. Fetor ex oris is commonly present, owing to the decomposition of retained food and secretions.

It is noted from experience that disk-shaped foreign bodies almost invariably lodge in the esophagus. Disks lie flat on the surface of the tongue, and in any act that propels them backward they remain so, dropping into the upper part of the esophagus. Necessarily a disk must assume a position approximately parallel to the vocal cords before aspiration can occur, and the mechanism, assuming this sagittal position, is probably in most cases associated with the attempt to regurgitation. The disk, having passed into the upper part of the esophagus, is thrown upward and is tilted by the arytenoids into a position parallel with the cords. In the inspiratory effort which follows the vomiting act, the foreign body is aspirated. The alae of the thyroid cartilage may also aid in the tilting.

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* Read at the Twelfth Annual Meeting of the American Bronchoscopic Society, San Francisco, July 6, 1929.

A case described by von Schrotter[1] demonstrates the necessity of a disk assuming a position parallel with the cords if it is to be aspirated. In order to perform a so-called conjuring trick, a man, aged 35, stuck a coin into his left nostril. By bending the head backward he let it slide into his throat, where he intercepted it by a slight cough, and brought it out by his mouth. He had done this often. On one occasion, the coin had stuck in the esophagus for sixteen hours. This time it dropped into the windpipe.

Killian[2] mentioned the case of a patient, aged 29, who was desirous of performing the same trick in another way. He also had stuck coins into his nose. He put a second one into his mouth, and by taking the former out of his nose, wished to produce the illusion that he had made it travel up from his mouth. During the proceedings the first coin began to move and slid into the trachea. Optimum conditions in position permitted the aspiration of these foreign bodies.

The site of arrest of a disk in the esophagus is almost invariably the same, viz., the entrance of the esophagus into the upper thoracic aperture. This is just below the constriction caused by the coricopharyngeus.

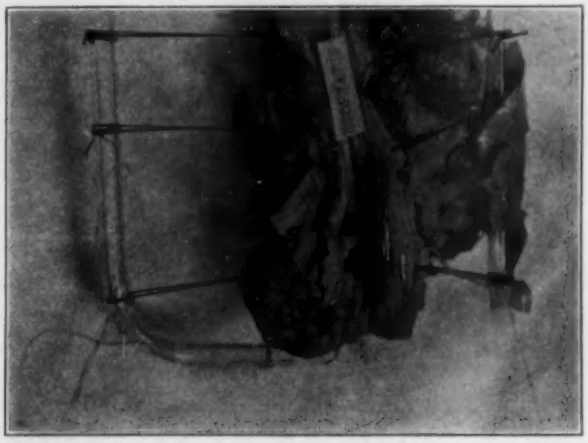


Fig. 1.—Anterior esophageal wall showing pouch which is bridged by a strip of normal tissue.

One might suppose that the arrest would be at the upper pinchcock, but it is actually directly below. This is explained by the fact that during the act of swallowing, the pinchcock is opened, and the disk, passing into the lower cervical esophagus, is caught by the loose folds of collapsed esophagus. If the disk is not sufficiently large to fill the lumen of the esophagus so that downward propulsive effort is lacking when the pinchcock is again closed, it will stay there, being held by the loose folds of esophageal mucosa. The point of lodgment, as already mentioned, is the superior thoracic aperture, and the esophagus at this point is passively collapsed by the pressure of the surrounding soft tissues. The esophageal lumen at this point is wide, as can be shown by endoscopic examination, and were it not for this collapse caused by the surrounding tissues, the foreign bodies would pass this point.

1. Von Schrotter, H.: Zur Bronchoskopie bie Fremdkörpern, Wien. klin. Wchnschr., 1907, no. 25.

2. Killian, J. A.: Entfernung eines Pfennigstückes aus dem rechten Bronchus eines Erwachsenen vom Munde aus mittelst oberer Bronchoskopie, München. med. Wchnschr., 1903, p. 1601.

An additional reason for disks sticking at this point is that the surface area of that part of the disk which is across the lumen in relation to that part of the disk in contact with the wall of the esophagus is much smaller than in the ordinary bolus of food.

It is of interest to note that the two largest disks encountered, namely, the half dollar and the advertising token, which was but a little smaller, were in the dorsal esophagus, well below the usual site. The half dollar also was not in the usual transverse position, being held in the oblique by the vertebral column.

Of all foreign bodies removed by peroral endoscopy, disks present the least problem. With a tube, usually an esophageal speculum, the disk is found, grasped and easily removed by traction. There is no difficulty in getting space for the forceps jaws, or in securing a firm grasp on the foreign body. The possibility of overriding the disk is easily avoided by anterior traction of the tip of the tube and careful inspection as the lumen opens. Slugs from switch boxes, six in this collection, have a sharp projection which is easily handled by using a rotation forceps on the opposite side of the disk from the projection.

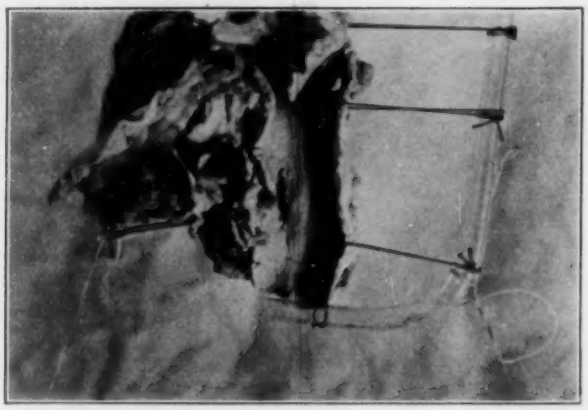


Fig. 2.—Interior of trachea showing slit in posterior wall through which disk had eroded from esophageal pouch.

In the forty-seven cases, there was one fatality. In September, 1927, a normal girl, aged 11 months, while playing with a part of a small tin whistle, choked and coughed. The mother, with an exploring finger felt the foreign body in the throat, but was only able to push the foreign body farther down. All symptoms subsided except an occasional gagging during and after eating. A pediatrician was consulted, who took an optimistic attitude toward the matter, this attitude being essentially, "Don't trouble trouble till trouble troubles you." The mother watched every stool for more than two months, with no results. Since there were no further developments and the child continued to be normal, the incident was more or less forgotten. In October, 1928, symptoms developed which were thought to be those of a cold. There were cough, fever and fetor ex oris. In about three months these symptoms subsided, and the child was apparently again normal. In March, 1929, some symptoms of respiratory irritation developed, and at this time a roentgenologic examination of the chest was made, with negative results. The presence of a foreign body was not demonstrated. One week before the patient's entrance to the clinic, she became unable to swallow. When swallowing was attempted, violent coughing ensued. It was reported that the child had not swallowed anything for a week.

Examination on admission showed a well nourished child suffering from marked dehydration and acidosis. A roentgenogram by Dr. R. G. Karschner showed a round opaque shadow in the middorsal region, apparently in the trachea, although it was in the transverse plane. Tracheo-esophageal fistula was demonstrated with the opaque meal.

With the patient under local anesthesia, a bronchoscope was passed into the trachea. A quantity of foul-smelling pus was aspirated, and the disk was seen lying transversely across the trachea. Granulations were noted at the edge of the disk. A grasping forceps was applied, and in attempting to rotate the disk to the sagittal plane, it was folded on itself and so removed. It proved to be a thin brass disk 15.5 mm. in diameter and $^{20}/_{100}$ mm. in thickness. It was perforated by two longitudinal holes.

A catheter was passed into the stomach and left in place for feeding. Energetic measures, including intravenous injections of dextrose, hypodermoclysis, proctoclysis and tube feeding failed to save the child, and she died about seventy-two hours after the removal of the foreign body. Air entering the digestive tract through the esophageal fistula, despite the feeding tube, was one of the most distressing conditions. A gastrostomy was considered, but the child was never in a condition to endure the operation.

The results of the autopsy, in brief, were as follows: The heart and lungs were normal, except for changes of a terminal stasis pneumonia. The abdominal viscera were macroscopically normal. In the anterior esophageal wall 3 cm. below the cricoid, there was a pouch lined with epithelium. Over this was a bridge of intact tissue. At the right extremity of this pouch there was a vertical slit some 15 mm. in length, which communicated with the trachea. The edges of this slit were covered with granulations which were continued into the trachea. On each lateral wall of the trachea at this level there was a line of granulations marking the site where the edge of the disk had rested. There was no evidence of suppuration of the lung except the terminal pneumonia as previously noted.

CONCLUSIONS

1. Disks are the commonest form of foreign bodies occurring in the respiratory and upper digestive tracts.
2. There is a clear anatomic explanation for the usual site of lodgment in the esophagus.
3. Disks rarely enter the respiratory tract.
4. The final disposition of a case of foreign body should be directed by those specializing in this work, who would never cease in their search for the suspected foreign body until every available means, including endoscopic examination, had been exhausted.
5. Too much reliance cannot be placed on a single roentgen examination.

AN UNUSUAL FOREIGN BODY*

CHARLES J. IMPERATORI, M.D., NEW YORK

A Star safety razor blade was removed from a patient at Kings Park State Hospital. The patient was 36 years of age and had for some time been confined to the asylum for dementia praecox, catatonic type. On March 13, 1929, in an attempt at suicide, after cutting himself in various places he swallowed the razor

* Submitted for publication, Nov. 18, 1929.

* Read at the Twelfth Annual Meeting of the American Bronchoscopic Society, San Francisco, July 6, 1929.

blade. Because of the wounds on the neck, abdomen and wrists, and as a cutting instrument was not found on the person of the patient, a roentgenogram was taken, which showed a safety razor blade, with a cutting edge on only one side, located in the upper portion of the thoracic esophagus. Late in the afternoon of that day, the patient was anesthetized, but when the esophagoscope was passed in the location that was predetermined roentgenologically, the blade was not found at this place; it had dropped to the lower portion of the esophagus, so that part of it was included in the cardiac end of the esophagus. A large Mosher esophagoscope was used; the blunt end of the razor blade was tilted so that the sharp right angle cutting edge was included in the end of the esophagoscope. The cutting edge was held at an angle of about 75 to 80 degrees away from the long axis of the esophagoscope, and the proximal end of the foreign body was included in the mouth of the tube with an alligator type of forceps; in this way the foreign body, forceps, and tube were removed together. In dislocating the foreign body from the grasp of

The Star safety razor blade, 40 by 20 mm., removed from esophagus of patient.

the cardia, which was in a mild state of spasm, there was a slight amount of bleeding. Following the removal of the foreign body, the patient made an uneventful recovery.

About ten years ago, I reported a similar case in which a Gem safety razor blade was located in the cricopharyngeus, this patient also having attempted suicide. This was easily removed, without any bleeding. The Jackson, old type, esophageal speculum was used; the sharp edge of the blade was drawn into the open part of the speculum, and the foreign body, forceps and speculum were removed together.

A SPECIAL LIGHTCARRIER FOR THE SEIFFERT SELF-RETAINING DIRECT LARYNGOSCOPE WITH CHEST SUPPORT *

JOSEPH W. MILLER, M.D., NEW YORK

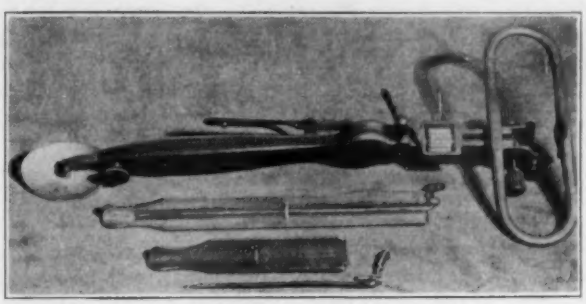
Laryngologists working with the Seiffert apparatus know best how to appreciate this ingenious instrument. Not only has it entirely overthrown the famous suspension laryngoscope of Killian and its cumbersome and dreadful gallows, but it has made the operation of laryngoscopy a simple one which can be carried out in all cases under local anesthesia.

The one drawback was the source of light. This was supplied by using a Kirstein or a Von Eicken headlight, both of which throw parallel rays at a long distance and therefore are useful in direct laryngoscopic work. But the headlight

* Submitted for publication, Oct. 24, 1929.

* From the Department of Laryngology and Bronchoscopy, Beth Israel Hospital, New York City, Service of Dr. Samuel J. Kopetzky.

with its long cable frequently becomes annoying. It is heavy on the head when worn for a long time, and it easily gets out of focus and necessitates frequent adjustments. Then, too, there are occasional shocks due to short circuits, and for demonstration purposes the operator must take off the headlight and give it to the observer. In doing so, the head band and the lamp have to be adjusted before and after.



These disadvantages led me to the idea of constructing a special lightcarrier—Jackson Type—which fits admirably well in the vaulted roof of the spatulas. This contrivance does away at once with all the disadvantages, giving a steady light from a dry cell battery without shocks and further annoyances.

The Jackson light attached to the Seiffert apparatus makes direct laryngoscopy an ideal and pleasant operation.

305 East 17th Street.

SUBMUCOUS TURBINECTOMY *

T. H. Odeneal, M.D., Beverly, Mass.

Although an eminent specialist has stated that he has seen no ill effects occur from removal of the middle turbinate, mucous membrane and all, there is no doubt in my mind that some harm must necessarily be occasioned to the mucous membrane of the air passages in time. It may take years, but a certain amount of dryness is to be expected when so large an amount of mucous and submucous tissues with their glandular elements is removed, not taking into account the increased space in the nose and thus more rapid admission of air to the lower air passages. When ethmoid exenteration becomes necessary, removal of the middle turbinate is advocated, mucous membrane and all, as I do not believe proper drainage can be secured in any other way. In this paper, however, I intend to deal only with those cases in which more adequate nasal breathing is sought.

Frequently a hypertrophied middle turbinate is found, especially when a submucous resection becomes necessary. One hesitates to remove this turbinate, although it is undoubtedly blocking the proper functions of the nose. If it is necessary to perform a submucous resection on account of a deviated septum, it is found that the septum, on coming into the midline after the operation, impinges

* Submitted for publication, Nov. 6, 1929.

against the hypertrophied turbinate, causing discomfort to the patient and narrowing that passage, or, as is often the case, the turbinate is so large that it will not allow the septum to return to the midline.

It is a simple procedure, by means of a sharp elevator, to separate the mucous membrane and submucous tissues from the underlying bone and remove as much of the bone as is desired, afterwards replacing the flap in position and holding it there for twenty-four hours by means of a petrolatum-soaked pledget of cotton. It will be found necessary to clip off a small portion of the flap before replacing it in position, as there will be a certain amount of redundant tissue. The incision is made along the inferior external border of the turbinate, and the dissection carried out internally; it is not necessary to separate it externally as this bone is always left. The hypertrophic turbinate is often found to contain a large cell which takes up the entire anterior portion of the turbinate and may at times contain pus, causing a congestion in that area. I have not found it necessary to employ stitches to hold the flap in place and there is little bleeding when the cocaine-epinephrine has worn off.

Little membrane is removed by this method, for which I do not claim priority, and the size of the desired nasal space may be obtained with exactness.

I have never been called on to reduce the inferior turbinate in this manner, but I do not see why this cannot be done just as easily when indicated.

News and Comment

AMERICAN BOARD OF OTOLARYNGOLOGY

An examination was held in Philadelphia, Oct. 21, 1929, during the session of the American Academy of Ophthalmology and Otolaryngology, held in Atlantic City.

One hundred and seventeen applicants passed the examination; five passed the preliminary examination, four were conditioned and thirteen failed.

In 1930, examinations will be held in Detroit, June 23, during the session of the American Medical Association, and in Chicago, October 27, the day prior to the meeting of the American Academy of Ophthalmology and Otolaryngology.

Prospective applicants for certificate should address the secretary, Dr. W. P. Wherry, 1500 Medical Arts Building, Omaha, for proper application blanks.

H. P. Mosher, M.D., President.
W. P. Wherry, M.D., Secretary.

Progress in Otolaryngology

A Summary of the Bibliographic Material Available in the Field of Otolaryngology

LARYNGEAL TUBERCULOSIS

REVIEW OF LITERATURE FOR 1928-1929

GEORGE B. WOOD, M.D.
PHILADELPHIA

Primary laryngeal tuberculosis in children is so exceedingly rare that its rarity influences the examiner greatly when he is making a differential diagnosis of a suspected laryngeal lesion.

Richter[1] reported an interesting case of laryngeal tuberculosis occurring in a child, aged 15½ months. The disease ran an acute course, there being only four weeks of illness from the first symptom to the fatal ending. A careful postmortem examination showed an ulcerated condition of the larynx which, on histologic examination, proved to be tuberculous. The paratracheal and laryngeal lymph nodes showed early stages of tuberculosis and there was some tuberculous ulceration in the intestinal tract, with involvement of the regionary lymph nodes. On the other hand, the lungs and the bronchial lymph nodes were absolutely free from any evidence of tuberculosis, as were also the liver and the spleen. Richter expressed his belief that this was a case of simultaneous and primary involvement of the larynx and intestinal tract due to infection from food. The tonsils were not examined; this was unfortunate, as it had been shown by animal experimentation that when food infected with tubercle bacilli was fed to hogs it produced tonsillar tuberculosis as frequently or more frequently than it did intestinal tuberculosis. It is possible that in this case some of the tonsillar tissue might have been infected and the larynx secondarily involved by an extension of the disease through continuity of structure. However, the laryngeal involvement was a primary one as far as the lungs were concerned. Its occurrence in a child aged 15½ months is almost unique.

Murray and Maxwell[2] reported a case which is of interest as a demonstration of the harm that may arise from a bloody operative attack on a tuberculous tonsil. The patient in this case was 22 years of age. There was a lesion on the left tonsil which, according to the authors, was suggestive of chancre. When this diagnosis was disproved, a tonsillectomy was done. The wound was slow in healing, requiring almost a month to do so; twenty-one days after it had healed, the beginning of an ulcerative process of the tongue was noticed. There

1. Richter, Helmuth: Zur Klinik und pathologischen Anatomie der primären Kehlkopftuberculose, Arch. f. Ohren-, Nasen- u. Kehlkopfh. **110**:225 (Nov.) 1928.
2. Murray, W. H., and Maxwell, J. A.: J. Laryng. & Otol. **43**:335, 1928.

was an extension of the disease downward, involving the larynx. Later miliary tuberculosis developed, and the patient finally died of tuberculous meningitis. Autopsy showed old tuberculous lesions of both pulmonary apexes. The authors said that they felt justified in operating on the tonsil because tuberculosis of the tonsil was extremely rare and they did not, therefore, suspect its presence. In this patient, however, not only was there tuberculosis of the tonsil, which should have been recognized and which is not extremely rare, but the patient was suffering from tuberculous disease of the lungs. Bloody operations on the tonsils of tuberculous patients are apt to be followed by a lighting up of any old tuberculous lesions that the patient may be suffering from; if a diagnosis of tuberculosis of the lung has been made, it is our firm belief that tonsillectomy is absolutely prohibited.

An extensive and carefully undertaken piece of research work, containing a review of all the literature on the subject, is that of Rickmann and Ernst [3] on the value of the urochromogen and diazo reactions, as well as of the blood count, the sedimentation test and allergy reactions, in the prognosis of laryngeal tuberculosis. In their review of the literature they said that most authors are in accord concerning the value of the urochromogen and diazo reactions in the prognosis of pulmonary tuberculosis. In these cases both of these reactions, when positive, indicate a certain amount of pathologic destruction of protein, the urochromogen test being the more sensitive. When these reactions are transitory, they indicate a more serious condition, though only when they are lasting and continuous is the prognosis absolutely unfavorable. They quoted Collet, who said that a positive diazo reaction in suspicious cases helps greatly in the differential diagnosis of tuberculosis, though a negative diazo reaction does not necessarily exclude tuberculosis. Rickmann and Ernst, however, in their researches in 100 cases of laryngeal tuberculosis did not agree with these observations of Collet. It was their belief that the urochromogen and diazo reactions have absolutely no value as far as diagnosis is concerned. They agreed, however, that a positive reaction indicates unfavorable prognosis and that as a rule the urochromogen reaction is more sensitive and appears earlier than the diazo reaction. From the therapeutic standpoint, however, a positive reaction is of value only in indicating that in such cases one should not undertake any extensive local treatment—such as the use of the cautery or the application of roentgen rays—and nothing more severe than general radiation with the Finsen light. Rickmann and Ernst found that the combination of the allergy test, the estimation of the sedimentation time of the red blood cells

3. Rickmann, L., and Ernst, F.: Ueber den Wert der Urochromogen und Diazoreaktion, sowie den des Blutbildes, der Senkungsreaktion und der Allergicprüfung für die Beurteilung der Kehlkopftuberkulose, Ztschr. f. Tuberk. **50**:465, 1928.

and a careful differential count of the white cells is of extreme value in the estimation of prognosis and in the determination of therapeutic measures to be employed. If these tests show a good resistance, surgical procedures and active therapeutic measures will get good results; but when the resistance is low, general treatment to raise this resistance should be undertaken before any radical local measures are carried out. An exception to this rule is when the pain on swallowing interferes with proper nourishment and hence there is the necessity of treating the lesions locally in order to allay the pain.

TREATMENT

A good deal of interest has apparently developed in Germany concerning the use of various gold salts in the treatment for pulmonary and laryngeal tuberculosis. Fischer [4] treated about 115 patients with various gold preparations. He said that the beneficial action of gold therapy is not due to the action of the drug on the disease itself, that is, it is not a true chemical therapeusis, but by stimulating the reticulo-endothelial system it increases the general body resistance.

Schmidt [5] obtained good results with a drug which has a gold content of 39.25 per cent. It is given intravenously, beginning with an initial dose of 0.025 Gm.; the second dose is 0.05 Gm.; the third, 0.075 Gm., and the fourth, 0.1 Gm. This rate of increase is continued for ten doses, when the final dose should be 2.5 Gm. At these doses the drug is well tolerated, and at least half the patients show no subjective symptoms of reaction. Almost all the patients showed general improvement though the drug did not so uniformly benefit the laryngeal lesions. Of six cases of laryngeal tuberculosis two showed distinct improvement and four cases no improvement.

Rickmann [6] was not quite so enthusiastic about the use of gold preparations and said that they should not be employed to the exclusion of local measures. A good combination is the use of injections of gold preparations and local irradiation of the laryngeal lesions. Rickmann expressed his belief that it is a mistake to consider gold compounds a cure-all for tuberculosis, and that while a great many patients show distinct improvement, he is not certain but that equally good results might be obtained by other methods.

Schlapper [7] used a colloidal gold salt containing 0.06 per cent of gold. He first investigated its dangerous possibilities on guinea-pigs. As

4. Fischer, A.: Ztschr. f. Tuberk. **52**:465, 1929

5. Schmidt, H.: Ein neues Goldpräparat zur Behandlung der Lungen und Kehlkoptuberkulose, Deutsche med. Wchnschr. **54**:1757 (Oct. 19) 1928.

6. Rickmann, L.: Die Goldbehandlung der Lungen- und Kehlkopftuberkulose, Med. Klin. **25**:103 (Jan. 18) 1929.

7. Schlapper: Die Behandlung der Lungen- und Kehlkopftuberkulose mit Goldpräparaten, Tuberkulose **9**:54 (March 10) 1929.

these animals stood the injections well and showed no evidence of anaphylaxis he used the drug in a large number of cases of pulmonary and laryngeal tuberculosis. In cases of laryngeal tuberculosis in which no local treatment was given, Schlapper said that the results were entirely satisfactory. The injections were made both intramuscularly and intravenously. The latter method probably causes less general disturbance, and neither method produced any evidence of kidney irritation. In 150 injections there was a slight transient shock in one case. The initial dose of the drug was 1 cc., which equaled about 0.6 mg. of gold. In one case the dose was increased to 5 cc. and the injections were given at first twice weekly and later once a week. One third of the cases became bacilli-free; in all there was a distinct lessening of the râles, and the roentgenograms showed shrinking of the diseased area.

Gainsborough and Jory [8] used Jacobson's solution of benzyl cinnamic ester in a series of selected cases of laryngeal tuberculosis. These cases were either stationary or getting definitely worse. The treatment consisted of a series of intramuscular injections of 0.25 cc. for twelve days, followed by rest for fifteen days. After three series of these treatments, the patient was given rest for one month before resuming the injections. Of seven patients treated, five showed distinct improvement, one little improvement and one started to improve but then became distinctly worse. The most striking feature was the disappearance of pain and dysphagia during the treatment. The authors expressed their belief that, if one considers the severity of these cases and the previous failure to improve, it must be believed that the benefit following the injections of Jacobson's solution was the result of the treatment. Positive sputum was obtained in all these cases until the end of the treatment. There were distinct roentgenographic evidences of the curative process going on in the lungs as the result of the three months' treatment in four of the six cases.

Apparently more interest is being manifested each year in the possibilities of roentgen therapy in the treatment for laryngeal tuberculosis. Unverzagt [9] said that the benefit that comes from irradiation of the tuberculous larynx is due to the stimulation of the connective tissue elements that surround the tuberculous area. This stimulation causes the connective tissue gradually to circumscribe and obliterate the tubercle, leaving simply a connective tissue scar behind. For this reason, the dosage should be one that stimulates and does not destroy tissue. He said that the proper dose is essential, and that the method of cross-

8. Gainsborough, H., and Jory, P. J.: Treatment of Tuberculosis by "Benzyl Cinnamic Ester," Lancet **1**:1142, 1929.

9. Unverzagt, W.: Die Kehlkopftuberkulose und ihre Behandlung, Fortschr. d. Therapie **4**:686, 1928.

firing the larynx, first from in front and then from each side, is the method of choice.

If a cicatrization of the tubercle can be produced by irradiation, one has a positive therapy for laryngeal tuberculosis. It would seem that the dosage necessary to produce the stimulation would be harmless, but it must be remembered that, for some reason, irradiation of the larynx is at times accompanied with not only severe acute reactions, but delayed phenomena which may in the end prove fatal. Badstober,[10] in his article on the dangers of roentgen therapy, particularly in laryngeal tuberculosis, reviewed a great part of the literature that has appeared in the last few years and showed conclusively that radiation, especially that for laryngeal carcinoma, is not free from harm. In these cases, of course, the dosage of roentgen rays is much greater than that which would be required in the treatment for laryngeal tuberculosis. He said that the cases of damage from irradiation so far reported none have been cases in which treatment was given for laryngeal tuberculosis. He reported, however, three cases which came under his own observation. The first was that of a woman, aged 36, with a slight tuberculous involvement of the larynx. She was treated with a single large dose of roentgen rays, which was followed by severe necrosis of the interior of the larynx and a fatal ending. Another case was that of a man, aged 35, who was treated twice with moderate doses. Closely following the second treatment, he became hoarse and developed odynphagia. The interior of the larynx was covered with a membrane which, however, gradually cleared up, though it was followed later by a deep, undermining ulceration of the laryngeal surface of the epiglottis. The third case was that of a man, aged 32, who, immediately after a surgical removal of the epiglottis and cauterization, was treated three times with moderate doses of roentgen rays. The larynx became so swollen that a tracheotomy was necessary, which, however, did not prevent a fatal ending.

During the past year, heliotherapy has apparently not received the enthusiastic acclaim that it did formerly. Sharp[11] said that in his hands the quartz light has not produced any change in the laryngeal lesion. In fact, Kayser-Peterson[12] reported the case of a girl, aged 18 years, in whom the tuberculous infiltration was apparently stimulated by the treatment. He was not positive that the irradiation was the cause of the progress of the disease, but at least it progressed in spite of the

10. Badstober, Paul: Die Frage der Röntgenschadigungen, insbesondere bei der Behandlung der Kehlkopftuberkulose, Folia Otolaryng. **29**:175, 1928.

11. Sharp, B. H.: Diagnosis and Treatment of Tuberculous Laryngitis, Rhode Island M. J. **12**:56 (Jan.) 1929.

12. Kayser-Peterson: Treatment of Pulmonary Tuberculosis with Quartz Lamp Irradiation, München. med. Wchnschr. **76**:987, 1929; abstr., J. A. M. A. **93**:811 (Sept. 7) 1929.

treatment. He thought it is advisable to omit radiation in this type of case.

Wessely [13] said that in selected cases he has had good results with diathermy or electric coagulation and that as far as heliotherapy is concerned, some of his patients were benefited. He believed, however, that its use depends a good deal on the general condition of the patient.

Schugt [14] said that in a fairly good percentage of cases, relief from pain in laryngeal tuberculosis can be obtained with actinotherapy with the ultraviolet rays. He uses the Kromayer quartz lamp, the light being projected into the larynx directly by means of the Atkinson laryngoscope. He has not obtained any marked results by the indirect method of reflecting the rays through a bent quartz tube.

It is apparent from the literature of the past year that the one method of treatment for laryngeal tuberculosis that is still being enthusiastically employed is the use of the electric cautery. Looper and Schneider [15] have so well summarized their results and beliefs concerning the treatment of laryngeal tuberculosis that it seems worth while quoting some of their conclusions. In his discussion of their paper, John W. Carmack of Indianapolis said that the electric cautery has undoubtedly come to stay. I quote the following conclusions from the paper of Looper and Schneider:

> The results of cautery treatments used sporadically in the Maryland Sanatorium until August, 1923, were so impressive and encouraging that we felt its continued and increasing use was our best form of treatment.
>
> Of all our patients with laryngeal lesions with moderate lung involvement treated by electrocautery, 65.5 per cent were improved and healed, and 26.5 per cent with far advanced lung involvement were improved and healed.
>
> In the Maryland Sanatorium we did not have any "unimproved" patients treated with cautery in the moderately advanced group.
>
> Cautery treatment in many patients exercised a favorable influence on the lungs and on the general condition. No bad results were encountered.
>
> Cauterization in all patients has been done under local anesthesia by the indirect method at monthly intervals.
>
> Results obtained by electric cautery treatment indicate without doubt that tuberculosis of the larynx is curable, if started reasonably early.
>
> In all suggestive cases we advise vocal rest or absolute silence. While active laryngeal tuberculosis does not have any tendency toward spontaneous healing, it is surprising with what rapidity some incipient cases with slight infiltration will clear up as the result of absolute silence. Therefore, regardless of whatever method of treatment is added, silence is imperative in all cases.

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13. Wessely, E.: Die Kehlkopftuberkulose, Wien. klin. Wchnschr. **42**:176, 1929.

14. Schugt, Henry P.: The Treatment of Dysphagia in Tuberculosis of the Upper Air Passages, Arch. Otolaryng. **8**:424 (Oct.) 1928.

15. Looper, Edward A., and Schneider, Leo V.: Laryngeal Tuberculosis, J. A. M. A. **91**:1012 (Oct. 6) 1928.

The electric cautery seems likely to supersede all other procedures and enjoys at present increasing recognition as the best method of treatment for laryngeal tuberculosis.

The revitalization of the tissues by induced hyperemia and the development of granulation tissue with formation of new blood vessels accounts for the good results obtained by the cautery.

Elevation of temperature (high degrees), marked asthenia and high blood pressure are contraindications in using the cautery, although in patients in whom serious symptoms (severe pain, difficulties of swallowing) demanded allevation, we did use the cautery to bring temporary relief.

In using the electrocautery, one thing should be particularly and strongly emphasized and that is the condition of the lungs. No laryngologist should undertake electrocautery treatment without cooperating with or being guarded by a clinician. Indiscriminate use of the cautery in unsuitable cases will do more harm than good and the method of treatment itself will be brought into disrepute.

Terry [16] stated the belief that the use of the electric cautery will result in healing nearly all cases of tuberculous ulceration of the tongue if used early and that it is the best method of treatment for the tuberculous larynx when voice rest fails. He said that with early lesions complete healing is the rule after a few cauterizations; even in advanced cases it is the most efficient method for the relief of the excruciating pain, and some extensive lesions will heal after this treatment. Sharp [11] believed in its use in practically all cases in which there is not high fever and also as a palliative measure in hopeless cases.

Schugt [14] advised the resection of the superior laryngeal nerve when the pain of laryngeal tuberculosis is very severe; this cannot be done, however, in extremely sick patients. The injection of alcohol into the superior laryngeal nerve is less reliable and is not entirely free from danger; cases of necrosis of the larynx have been reported, and in one of these a mediastinal abscess developed. In one of his own patients, paralysis of the tongue followed the injection, owing to a simultaneous blocking of the hypoglossal nerve along with the superior laryngeal nerve. Edema of the larynx is not infrequent, and in one case of bilateral simultaneous injection Schugt was forced to do a tracheotomy. He uses the method originally suggested by Aurelius Reti, that of making injections into the superior nerve in the pyriform sinus. According to Zuckerkandl, the nerve can frequently be seen crossing the upper part of the pyriform sinus transversely, but Schugt himself was able to see it clearly in only two cases. The point of the injection should be in the fold of mucous membrane below the plica pharyngo-epiglottica where the shallower part of the sinus merges into the deeper portion; he generally makes the injection with a curved cannula by the indirect method. Only one side at a time should receive the injection on account of the edema which may follow this procedure.

16. Terry, Geo. H. B.: Cautery in Tuberculosis of the Tongue and Larynx, South. M. J. **22**:147 (Feb.) 1929.

Abstracts from Current Literature

Ear

ACUTE MASTOIDITIS IN RELATION TO EPIDEMICS. E. URBANTSCHITSCH, Monatschr. f. Ohrenh. **63**:882 (Aug.-Sept.) 1929.

Urbantschitsch made a statistical study of the operations done at his clinic within the last fifteen years. Six hundred and thirty-seven mastoidotomies were done on 533 patients; on 104 patients, the operation was done on both sides. The discrepancies found between his own results on the incidence of mastoiditis in infectious diseases and Barwich's previous reports may be explained by the difference in their material, Urbantschitsch's clinic being at the main hospital in Vienna, to which all patients with infectious diseases are referred.

ANGIONEUROTIC DISTURBANCES OF ACOUSTIC NERVE. K. GRAHE, Ztschr. f. Laryng., Rhin. **19**:95 (Jan.) 1930.

Grahe presents a comprehensive review of the literature on angioneurotic disturbances of the acoustic nerve. In conclusion he states that he hopes his review has shown that angioneurotic disturbances are of great significance in otology, not only as a disease *sui generis* but frequently as one superimposed on other organic diseases the recognition and treatment of which, particularly with regard to the psyche of the patient, are of great importance. Accompanying the article is a bibliography containing 232 references.

PERMANENT INJURY OF ACOUSTIC NERVE CAUSED BY ROENTGEN STERILIZATION. S. UNTERBERGER, Ztschr. f. Laryng., Rhin. **19**:132 (Jan.) 1930.

Unterberger reports two cases of permanent injury of the acoustic nerve following roentgen sterilization. In the first case, that of a woman, aged 54, the injury involved both cochlear and vestibular nerves; in the second case, that of a woman, aged 50, it involved only the right cochlear and vestibular nerves. As proof of the fact that in both cases there was a causal relationship between the artificial exclusion of the ovarian functioning and the disturbance of the acoustic nerve, the author advances the following facts: 1. The disturbance of the acoustic nerve appeared immediately after the appearance of the artificially produced menopause. 2. It developed simultaneously with other characteristic disturbances of the menopause. 3. A thorough medical and neurologic examination did not reveal any other possible cause of the disturbance of the acoustic nerve.

MÉNIÈRE'S DISEASE WITHOUT INVOLVEMENT OF COCHLEAR NERVE: REPORT OF CASE. A. GIESE, Ztschr. f. Laryng., Rhin. **19**:136 (Jan.) 1930.

Giese reports a case of typical Ménière's disease in a youth, aged 18, in whom the cochlear nerve was not involved. In a review of the literature he was unable to find a report of a similar case. In his case repeated apoplectiform attacks occurred in an ear that had previously been normal. The three cardinal symptoms of Ménière's disease (disturbances in equilibrium, nausea with vomiting and subjective auditory disturbances in the form of intense tinnitus aurium) were present. All tests were repeated several times and control tests were made. Particularly striking was the fact that neither during the attacks nor as a sequel of the disease was a decrease in the hearing demonstrable. The author believes that the subjective tinnitus aurium was not a symptom of an organic involvement of the cochlear nerve but was caused by a collateral condition. Although a considerable decrease in the hearing has hitherto been considered as a characteristic symptom of Ménière's disease, in the case reported by the author the

disease remained localized in the vestibular nerve, and the hearing remained unchanged in spite of numerous attacks.

EFFECT OF STIMULATION OF VESTIBULAR NERVES IN SWIMMERS. K. BECK, Ztschr. f. Laryng., Rhin. **19**:141 (Jan.) 1930.

Beck states that when some persons with a pathologically changed ear are under water, an excessive stimulation of the vestibular nerves results in a decrease or a complete loss of the sense of orientation; this may place the person in great danger and in particularly unfavorable cases may result in his death. The cases of sudden silent disappearance from sight of persons while swimming are not to be ascribed to the vestibular nerve. The author emphasizes the fact that in all cases of defects in the tympanic membrane and of cavities from radical operation measures should be taken to prevent the entrance of water into the ear.

Pharynx

TOPOGRAPHY AND MECHANISM OF THE TONSILS. B. CHORONSHITZKY, Monatschr. f. Ohrenh. **63**:1058 (Oct.) 1929.

On the basis of his personal studies and a review of the literature, Choronshitzky comes to the following conclusions: The anlage of the tonsils is developed in the interarcual tonsillar fossa under increasing positive pressure; thus concentric layers of the peritonsillar connective tissue result, which form the basis of the capsule in the deep-seated tonsil. The pedicled tonsil, however, has no capsule. The last type of tonsil, therefore, cannot harbor a subcapsular abscess, and expulsion of its contents is far more easy than in the deep-seated tonsil. The double lobe of the tonsil is due to persistence of the embryonic intratonsillar fold, as von Hammar stated. The capsule caps the outer and upper surface of the tonsil, enclosing the fossa supratonsillaris. The fringe of the tonsil lies between the mucous membranes of the side wall of the pharynx and the interarcual fossa. It is due to this cap that the enucleated tonsil appears on frontal section shaped like an arabic six (6). On its dorsal surface, the subcapsular abscess forms protuberances of varied size. Evacuation of chronic subcapsular abscesses are of far-reaching importance in various diseases of the tonsils. However, opening of a peritonsillar abscess with a stump hook by way of the lacuna is dangerous, and the result is doubtful. Recurrences after tonsillectomy are prevented only if the entire tonsillar fossa is enucleated.

Nose

CHANGES OF TEMPERATURE IN NOSE AS GUIDE IN DIAGNOSIS. I. M. KRUKOWER, Monatschr. f. Ohrenh. **63**:838 (Aug.-Sept.) 1929.

Krukower reports that the temperature in the nose as measured under the middle concha and under the inferior concha increases in both places in the same proportion in diseases of the accessory sinuses (maxillary sinus). In unilateral involvement of the maxillary sinus, the temperature is higher on the involved side than on the normal one. The severity of the inflammation is directly proportional, and its duration is inversely proportional, to the temperature; a chronic, long-drawn process shows only a moderate increase of temperature. Injection of 5 cc. of milk (protein irritation) causes a focal reaction shown by a rise in temperature. On the basis of his experience in seventy patients, Krukower concludes that these measurements are a valuable aid in determining the diagnosis and the extent of the involvement.

OZENA: RESULTS OF SURGICAL TREATMENT. M. MEYER, Ztschr. f. Laryng., Rhin. **19**: 178 (Jan.) 1930.

Of five persons with ozena operated on according to Lautenschläger's method (displacement of the lateral wall of the nose) examination from three to five years later revealed that in only one, who irrigated his nose regularly, was the

subjective condition improved; even in this patient, however, the objective condition was bad. In all of eleven patients operated on according to the author's method (implantation of several small pieces of tibia into the wall of the inferior meatus) and examined from two to four years later, the results were likewise unsatisfactory. The author therefore advises against operation in cases of ozena and recommends a return to the old forms of symptomatic treatment.

Miscellaneous

FOREIGN BODIES IN THE ESOPHAGUS AND RESPIRATORY TRACT. B. HALMÁGYI, Monatschr. f. Ohrenh. **63**:847 (Aug.-Sept.) 1929.

Halmágyi reports that during the period between 1922 and 1928 he extracted 112 foreign bodies with the help of the esophagoscope or tracheobronchoscope. The foreign body was located in the esophagus fifty-eight times; six times in the pyriform sinus, eight times in the larynx, nineteen times in the trachea and twenty-one times in the bronchi. Patients who had a foreign body in the esophagus reported at the clinic sooner than those with one in the respiratory tract; only four of these reported within twenty-four hours of the accident, the others, days and even months later. On the whole, foreign bodies are well localized, depending on the intelligence of the patient. Some have maintained that they suffered from dyspnea, when neither the site nor the size of the relatively small foreign body could have caused a respiratory disorder; on the other hand, bronchial cases were noted in which the patients had difficulty only in swallowing. Halmágyi points out that the main cause of complications may be ascribed to the fact that a specialist is consulted only after weeks or months. To avoid these complications, immediate advice or treatment is necessary.

WEATHER AND DISEASES OF THE UPPER RESPIRATORY TRACT. F. BLUMENFELD, Ztschr. f. Laryng., Rhin. **19**:185 (Jan.) 1930.

Blumenfeld states that in statistics the effect of the weather on the morbidity and mortality of diseases of the respiratory tract may disappear completely. He emphasizes the fact that in researches on the relationship between the weather and the frequency of various infectious diseases it is extremely difficult to determine at what time the infection that caused the disease occurred.

Society Transactions

GERMAN OTOLARYNGOLOGICAL SOCIETY

ABSTRACTED BY A. LEWY, M.D. *Chicago*

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FORTY YEARS OF THE RADICAL MASTOID OPERATION. DR. OTTO MAYER and DR. H. BEYER.

(The following abstract was made by Dr. A. Lewy partly in collaboration with Dr. Samuel Salinger.)

Kuester was the first (1880) to state the idea of the removal of all diseased tissue—the first to advocate removal of the posterior meatal wall in order to gain access to the tympanic cavity and remove diseased tissue there. Bergman, in his first system of surgery, was the first to advocate the removal of the superior as well as the posterior osseous wall. Both these men were general surgeons and the otologists feared the invasion of their field by them. Wolf, in 1877, had suggested opening the tympanum via the posterior wall, but he attracted no attention. Hartmann made anatomic studies, but could not figure out how this operation could be carried out without danger to the facial nerve and labyrinth, but Zaufal, in 1890, solved the problem and saved the otologists. He used a vertical incision behind the ear, jointed by a horizontal one running forward at the root of zygoma. H. Stacke at the same time was working on the problem and published his results a little later. He made the single skin incision, dislodged the soft parts of the canal forward and worked from the tympanic cavity backward to the antrum and mastoid. The technic of these two men is described more in detail later. Stacke was also first to do the plastic operation on the canal and show the value of epidermization of the cavity. Jansen, in 1893, introduced the "conservative" radical operation, but also introduced more radical bone work in appropriate cases. Further modifications were later introduced by Siebenmann and Scheibe.

Zaufal, in 1893, gave his indications as follows: (1) all chronic suppurative otitis media with swelling, abscess or fistula of the cortex, bony stenosis of the canal or facial paresis; (2) onset of symptoms of brain complications; (3) cholesteatoma; (4) sequestration or tuberculosis in the middle ear and (5) profuse, thick purulent discharge, tubercular or actinomycotic.

Bezold and Heine pointed out the danger of a perforation in Shrapnell's membrane and of caries of the tympanic margin, and urged these as indications for the radical operation. Koerner laid emphasis on bony necrosis as an indication, and gave various symptoms to indicate when this was present.

Mayer and Beyer sought to define chronic suppurative otitis media, and quoted Bezold: "Under this head we understand all those infections of the middle ear in which a permanent perforation is present whose edges are cicatrized, and in which suppuration is present continuously or intermittently over a period of years."

The difference between the dangerous and the nondangerous types was pointed out by Bezold in 1875-1877. It was also recognized by other authors that the central perforation was not dangerous. Later others pointed out the dangers of isolated infection in the attic. Kuemmel termed the two types as epitympanal and mesotympanal infections. The site of the marginal perforation was recognized as indicating caries in the attic, antrum or ossicles. When the latter was recognized by Schwartze there followed a period in which extraction of the ossicles was practiced in the belief that it would cure the suppuration. Stacke,

however, showed that caries of the ossicles was not the most important factor, but that caries of the attic and antrum was. Histologic studies by Scheibe then showed that caries of the bone was not the only factor, but that the defects in the bone that were found were the result of rarefying osteitis resulting from previous acute infections. This was corroborated by Siebenmann and Sporleder.

This matter was a subject of debate for years. Manasse in his book on the pathologic anatomy of the ear wrote extensively on the question of disease of the bone in chronic suppuration, and differentiated between a productive and a destructive form; in the latter he found abscess formation, resorption of bone and sequestration. Other authors are quoted on the subject; e. g., Kaufmann and M. B. Schmidt defined caries as "every ulcerating process in bone the result of an interstitial intraosteal growth of granulation tissue, which takes on a chronic progressive course leading to a more or less definite loss of bone structure. A defect results at the carious spot." In conclusion, Mayer and Beyer state that the question if chronic suppuration with bone destruction and without cholesteatoma may exist is not settled. Newer studies have shown that bone disease may exist in central perforation, but that it is due to acute infection of the old harmless otitis media; in such cases the disease is in the antrum and not in the attic, and therefore amenable to cure by the simple mastoid operation. The authors say that one cannot often be wrong in assuming that chronic suppuration with bone disease is due to cholesteatoma. Temporal caries in nonspecific otitis media does not fit the bone process found and should be termed rarefying osteitis.

There is a possibility of cure through purely conservative treatment. Scheibe over a period of eighteen years operated on only 3 per cent of his patients with cholesteatoma, and he never lost one case by intracranial complications. His good results were due to the following facts: 1. Most cases were private, and treatment was given personally with scrupulous care. 2. After the ear was dry each patient was inspected every two months. His treatment was irrigation of the attic and the antrum and the use of boric alcohol.

The general opinion is that cases of cholesteatoma cannot be permanently cleared up in this manner, because as long as the middle ear and antrum are lined with epidermis there is bound to be an accumulation of the masses. Some cases are more favorable than others, depending on anatomic conditions.

In marginal perforations of the posterior half, if conservative treatment quickly stops the odor and discharge and if the discharge is largely mucus, the ingrowth of epithelium has not reached the antrum and deeper epitympanic recesses, which are often shown to be lined with hyperplastic mucosa which will recede if good drainage is afforded. Such cases can be cleared up by conservative treatment.

Perforations in the membrana flaccida may quickly follow acute epitympanitis without many acute symptoms. The perforation may be so small as to be overlooked, and epidermis may grow in rapidly and develop largely in the antrum. Such patients after a symptomless interval may suddenly develop alarming symptoms of intracranial complication. Irrigations of the attic are not only difficult but dangerous. These cases are not amenable, as a rule, to conservative treatment.

Histologic studies have shown that caries of the ossicles is really either an acute rarefying osteitis following an acute otitis media or a chronic rarefying osteitis in the presence of cholesteatoma. In the first case recovery occurs without removal and in the second case removal does not destroy the underlying cause and is useless. Only in cases of marginal perforation of the posterior part of the membrana tensa is there a possibility of cure by ossiculectomy, and then provided cholesteatoma has not invaded the antrum. In perforation of Shrapnell's membrane it is of no avail.

All authors are agreed as to the dangers of intracranial complications in cases of acute exacerbation of chronic suppuration. The general consensus is that the radical operation should be done at once. The only exception to the foregoing rule, as pointed out by Beyer, would be when no cholesteatoma was found at

operation and the local examination showed no marginal perforation. In such cases the simple mastoid operation would suffice.

Heine pointed out certain indications for a radical operation in cases of acute suppurative otitis media:

1. When a previous simple mastoid operation has failed to stop the discharge, and symptoms of retention are present, such as headache and fever, there is danger of invasion of the jugular bulb or labyrinth.

2. When the Gradenigo syndrome is present it calls for a thorough search of peritubal and perilabyrinthine cells.

3. In scarlet fever otitis with extensive destruction of the drum and ossicles, one should wait until the acute symptoms have subsided and the abscess or sequestrum has demarcated itself.

4. In intracranial complication, a radical mastoid operation should be done at once, especially in marginal perforation or cholesteatoma. A headache radiating forward from the ear or a feeling of numbness are significant, as is an unexplained high temperature, so that one should not wait for further signs. In case of central perforation it is well to do a simple mastoid operation and await developments. Facial paralysis in cases of marginal perforation or cholesteatoma is an urgent indication for radical operation. Delay may mean sacrifice of probable nerve recovery. The only error may be in cases of central perforation when paresis is due to syphilis or to rheumatism.

Mayer and Beyer refer to the work of Zange and Ruttin in 1927 for indications in cases with labyrinthine symptoms. They also refer to reputed cases of intracranial complications in central perforation, and advise that if acute exacerbation occurs a simple mastoid operation should be done at once.

Many cases of exostosis of the canal are associated with congenital nerve deafness of various degrees; also, such ears are sensitive to the shock of operative trauma which may further reduce the hearing. The danger of commotio labyrinthi from extravasation in the labyrinth was shown by Schwartze. Patients usually recover in a few weeks. Signs of secondary inflammation in the bone are the result of repeated irritation of the canal. Exostoses are of dense bone and difficult to remove; they have a tendency to recur unless they are thoroughly removed. Only isolated pedunculated ones can be knocked off. Otherwise the posterior canal wall must be removed as far as the bridge which is left intact.

In carcinoma of the middle ear, one is never able to expose all the growth, which has usually passed beyond the tympanic cavity before symptoms appear. Operation is useless, and radium is of no effect.

General opinion has not favored a radical operation: (1) as a preliminary to removal of an acousticus tumor and to an operation on the labyrinth, and (2) in basal fractures. Voss pointed out the dangers of secondary infection of the meninges from an existing otitis media infection introduced at the time of the accident, and he urged operation. Lange was more conservative. In general the opinion is that unless there is impending meningitis, not to operate. Meningitis was responsible for only 2.3 per cent of fatalities in a series of cases studied by Zange.

In children as a rule the operation is to be conservative. Only in the most urgent cases should a complete radical operation be done. It is better to do a simple mastoid operation and to wait until the child is older. The operative cavity in children is larger and more difficult to epidermize than in adults.

Absolute indications for a radical operation are: (1) intracranial complications ensuing in the course of chronic suppuration, with cholesteatoma; (2) threatening symptoms, such as headache, dulness, vertigo, etc., appearing in a case with cholesteatoma; (3) an abscess occurring in the mastoid or in the canal in chronic suppuration, or a fistulous breaking through in either location; (4) as a preliminary to the labyrinth operation or in acute suppuration with abscess at the petrous tip (Gradenigo syndrome).

Relative indications are: (1) chronic suppuration with marginal perforation of the posterior half, when careful conservative treatment has failed and especially when cholesteatoma and recurring granulations are demonstrated; (2) chronic suppuration with perforation of the membrana flaccida, persistent foul discharge and recurrent granulations despite frequent treatment, and (3) certain cases of exostoses, tumors and basal fractures.

(Thus far, the abstract was written in collaboration with Dr. Samuel Salinger.)

The object of the radical operation is to convert into one cavity, open to inspection and treatment, the tympanic cavity, attic and antrum. The principal methods of approach are described: that of Stacke, via the external canal and attic; that of Zaufal, along the posterior canal wall, and the method based on the original Schwartze operation, via the planum mastoidea and the antrum.

For the skin incision, Zaufal originally used an L-shaped incision, one cut vertically behind the auricle, the other horizontally forward at the level of the zygoma, but later the single curvilinear incision at various distances behind the auricle became generally adopted (Heine, Koerner, Passow and Bezold). If a fistula is present the incision may be made through it, and if the soft parts are inflamed and swollen, requiring a larger incision, this may be made, or a horizontal one may join it if bony necrosis or changes in the dura require it. If it is necessary to continue the incision forward to get sufficient displacement of the fleshy canal, Koerner's suggestion to keep below the temporalis muscle is important.

Zaufal said nothing about separating the soft parts of the canal, but he made a tongue flap by two incisions posteriorly. Stacke elevated all the soft parts and pulled them outward, claiming that no ill effects ensued, as against Panse and others who thought that atresia of the canal and bony necrosis could be traced to careless handling of the soft canal. The opinion today is that bone splinters, remains of cholesteatoma or ossicles, or unremoved spurs on the attic wall are the causes, and that the fear of bony necrosis is unfounded.

Both Zaufal and Stacke used the gouge for the bone work; Zaufal also highly recommended the rongeur. Most of his early cases were fistulous, with large cholesteatomas and overhanging cortex, suitable for rongeur work. Stacke, on the other hand, had cases of sclerosed mastoids with small antrums, which he approached from the bony canal and attic, using his protector over the inner tympanic wall. In cases with large cholesteatomas he approached via the antrum, as Schwartze did, while Zaufal in sclerotic cases operated similarly to Stacke.

Jansen further enlarged the cavity by removal of the attic wall and the margo tympanici below, and showed that one need not fear accidental uncovering of the dura or sinus in trying to be thorough.

Stacke located the antrum by a probe inserted via the tympanic cavity. Zaufal chiseled along the posterior canal wall or just below the linea temporalis, but in cases of sclerosis advised the tympanic route for the probe. Recently Stacke's idea has been used more frequently (Beyer and Hinsberg). Beyer advises the Stacke method when (1) the sinus is far forward, (2) in sclerotic mastoids and (3) when the attic is narrow. The first two conditions are disclosed early in the chiseling; the third is discovered as soon as the soft parts are displaced. In poorly developed zygoma roots the bony canal is short and the attic shallow. If the roots are wide the upper canal wall and the attic gain room. A short, angled posterior wall and an oval canal also indicate a shallow attic.

A series of life sections are shown, which indicate: The tegmen antri, in both pneumatic and sclerotic mastoids, in relation to the dura of the middle fossa lies 5 mm. higher than the upper canal wall. The antrum is mesial to and above the canal wall, so that the surest route to the antrum is via the upper canal wall. The posterior wall may lead to the facialis. In sclerotic mastoids the antrum is further behind the posterior wall and deeper in the mastoid so that the easiest approach is via the canal, and the nearer the membrana tympani the better. On the other hand the approach used by Zaufal gives a funnel-like opening for observing the antrum, and may reveal lesions of the posterior part, including fistulas communicating with extradural abscesses, which could

easily be overlooked in the approach by the Stacke method. One such case is reported. Mayer and Beyer advise the following choice of methods on the basis of experience and anatomic relations:

1. In fistulas of the cortex and abscesses of the mastoid with large cavities and in complicated cases, the method of Schwartze.

2. In sclerotic cases and narrow canal, Zaufal's method via the upper posterior canal wall, widening the approach, then opening the antrum above and mesially to the upper canal wall. If the antrum is not easily found by this method one uses the small recurved gouge according to the method of Stacke and removes the attic wall, which discloses the antrum bulge posteriorly. One can then chisel above and parallel to the posterior canal wall with the assurance of being above the horizontal canal. The posterior wall must be removed sufficiently for the discovery of a possible cholesteatoma, perhaps beyond the sinus. The authors decry the use of the Stacke "protector."

It is highly important to be oriented as to the course of the facial nerve. This lies across the inner tympanic wall above the oval window, at the posterior edge of which (where it lies below the horizontal canal) it courses perpendicularly downward to the stylomastoid foramen. However, it may go diagonally outward under the posterior canal wall, or diagonally backward through the mastoid process, and so may be in dangerous proximity to the usual operative approaches. Mayer and Beyer quote principally Schwartze and Randall in studies of the course of the facial nerve. More recent and detailed works of other authors are not mentioned.

Uncovering of the dura has led in a few reported cases to complications. Mayer and Beyer express their belief that the danger is slight if proper precautions are taken in the after-care. On histologic analysis, (O. Mayer) dehiscences, hernias of the brain and vessel communications were at fault rather than the operative exposure. Most of the reported cases were acute suppurations. In some instances it is impossible to reach the antrum without uncovering the dura, but in any event this is far better than injuring the horizontal canal or the facial nerve. Uncovering the dura is indicated in cholesteatoma with headache because of the frequency of extradural or brain abscess in such cases. Also it is important to have a smooth upper wall; otherwise, cholesteatoma buds may be present in the depressions and lead to persistent discharge. There is no danger of adhesion to the facial spur if this is properly removed. The bony defect in the tegmen quickly regenerates. The authors say that in fifteen years they have seen no ill effects from uncovering the dura in the radical operation. As after care the plastic flap must not cover the dura, too long tamponade is to be avoided, and most important, in acute exacerbations posterior drainage wet dressings and careful control of the wound are essential. Injuries to the dura are, however, dangerous. Removal of the epitympanic wall is important until a smooth surface exists between the canal and the attic.

In cholesteatoma in the antrum and tympanum, Zaufal used thorough curettage plus thermocautery or trichloracetic acid. Siebenmann used only careful irrigation and strove to protect the epidermis. At present a middle course is pursued. All pockets and depressions are carefully smoothed by chiseling, as in their depths there may be indications of deeper-lying conditions. Granulations and soft bone are curetted to healthy tissue, and epidermis is merely wiped or sponged away, leaving smooth epidermis in places. An exception is made of granulations in the canal region of a functioning labyrinth, as this may heal with preservation of function if the rest of the radical operation is done well (Heine, Scheibe, Uffenorde, Neumann, Ruttin and Zange). If the labyrinth is generally invaded by cholesteatoma or granulations the clinical picture will usually indicate its exenteration. If the labyrinth functions and there are granulations in areas between the canals, these may be curetted. Not seldom it happens that loss of function or positive liquor observations after a radical operation indicate labyrinectomy.

Tubal closure and treatment of the tympanic cavity has been a subject of discussion since the radical operation has been done, as the tubal discharge was

considered the frequent cause of reinfection. Siebenman (1893) first called attention to this. He recommended as a preventive: leaving open the posterior wound, avoidance of too thorough curettage of the tympanic cavity, preservation of tympanic membrane remnants and leaving the cholesteatoma matrix. He claimed excellent results. In 1907, the same procedure was recommended by his pupil, Nager, who stated that tubal suppuration was almost never seen in their clinic. On the other hand, Grunert (1896) emphasized the necessity of tubal closure for the epiderminization of the operative cavity. Jansen later called attention to curettage of the hypotympanic cells. Curettage of peritubal cells and actual cautery in the tube were practiced by Ferreri. Winker (1903) advocated removal of the anterior canal wall to obtain better access to the tubal region, but he said that tubal discharge was usually merely catarrhal and benign. Koerner called attention to obscure diseases of the adenoid and tubal region as a cause of discharge. Gerber tried skin grafts in the tube; Urbanschitsch used irrigation, massage with rasp bougies and medication, but like other observers found lessened hearing after tubal closure. Lange (1910) showed that while tubal closure was desirable, the most careful removal of mucous membrane and curettage of tubal cells fails to bring about closure, as the tubal epithelium regenerates too fast to permit scar tissue to grow over it; he expressed his belief that healing of remnants of membrana tympani over the ostium, when possible, offers the best chance. Wittmaack (1910) recommended a pedicled skin graft from the wound margin, held into the tube by a catgut strand which had been brought out from within via the eustachian catheter. Later the same idea was tried by Pierce. Haberman and Gomperz tried trichloracetic acid, and Yankauer devised a mushroom-shaped tubal curet. Passow used catgut nails to plug the tube. It developed later that the radical treatment in the tube was dangerous to the carotid, as was radical treatment in the tympanic cavity to the labyrinth. Scasz reported, in 1922, ten stubborn cases healed by roentgen rays.

The author believes that on the whole the best results are obtained by cutting down the bridge, removing the facial spur, carefully cleaning the bone splinters and grossly diseased tissue out of the cavity with a dull pincet, and wiping it out.

He thinks that the operation has not brought the expected progress in forty years, that it should not be named the "radical operation" in the sense that it insures definite healing, and that it still remains one of the most difficult of surgical procedures. He does think, however, that correct indications and appropriate technic are important in the outcome, and that the result of the operation is determined practically at the end of the bone work.

THE RADICAL OPERATION: II. THE PLASTIC OPERATION. DR. HILMAN BEYER.

The younger otologists are unfamiliar with the development of the radical operation. They know vaguely the Stacke and Zaufal operations. For the plastic operation, with the history of which they are equally unfamiliar, they adopt one routine without understanding the underlying indications. As a rule the mastoid operation consists of the Schwartze entrance through the antrum, after which the posterior wall is removed and the attic wall is taken down. Schwartze's statement that in many cases the operation is only the beginning of the therapy and that in most cases the result depends on the after-care, is still largely true today. At first the easily stenosed canal was held open by tampons, later by a lead nail, and daily irrigations over a long period were essential. Fear of the cholesteatoma necessitated the posterior fistula. Kuester was the first to remove the posterior canal wall (which had been previously advised by Karl Wolf), but Stacke performed the first plastic operation. From this time on, numerous methods of treatment of the soft parts were devised.

Beyer illustrates innumerable varieties of plastic operations on the soft tissues of the canal, most of which are described in textbooks. The fundamental ones are those of Stacke, Panse, Jansen, Siebenmann, Koerner, Bruehl and Passow, the others being modifications of these. In general the best plastic operation is one devised for the case in hand. The flaps should not encroach on suspicious

bone, or on exposed sinus or dura, and should be so arranged as to give the best view and control of the cavity. The Bárány technic of careful conservation of the soft parts and, after painstaking cleansing of the tympanic cavity, of replacing them uncut, or with only a temporary cut when absolutely necessary, has not been entirely successful in the hands of many other otologists. It was criticized by Bruehl, as more often requiring reoperation, and by Neumann, who said it is suitable only for a wide canal associated with a small mastoid exenteration. Beyer omits the plastic operation only in the presence of complications that necessitate leaving the posterior wound open, and in such cases does a secondary operation, as he also does in those cases in which the first plastic operation leaves too small an opening for proper observation of the cavity. The various methods are discussed in great detail. Neumann cuts a flap to lie upward or one to lie downward, according to which part of the cavity he wants to cover. If he has uncovered the middle fossa dura the flap is laid downward; in a low lying hypotympanum, the flap lies upward. Otherwise he uses either the Bruehl with a rectangular flap from the concha, or the triangular conchal flap, in either event with a horizontal cut in the posterior wall.

The object of the flap and the after-treatment is to preserve an epidermized cavity. The two general methods in use are the tampon, and the open method with drying powders; in either case one should control granulation tissue, and the tendency to form pockets or strands that interfere with drainage by tampon, chemical or actual cautery. Here again numerous technics are described in detail. Most operators use the packing until there is no danger of narrowing the cavity; i. e., until there is epidermization over the narrowest portion, between the facial ridge and the roof, then using the open method, with dusting powder or ointment. Urbantschitsch advised the use of 2 per cent salicylic alcohol after granulation stops. For destroying granulation tissue the preferred methods are the silver nitrate pearl or the actual cautery. Jansen preferred from 5 to 10 per cent silver nitrate solution at 2 day intervals in three successive applications, as too strong applications cause too much exudate and resulting maceration. Chromic and trichloracetic acids have been reported as causing deep-seated symptoms, such as labyrinth irritation. Grunert and Heine recommend from 20 to 30 per cent lactic acid well rubbed in as safe and efficacious in controlling granulations. Alcohol was used by Heath. Others used drying powders, of which boric acid seems to be the favorite, although many proprietary drugs are mentioned.

For stimulation of the epidermis Bondy used picric acid in ether, 1 : 10, fanning the area to produce rapid evaporation of the ether, which is painful. Bruehl used zinc ointment for the protection of young epidermis, and Stein and Gaudier 5 per cent scarlet red ointment. Borries used 5 per cent hypertonic salt solution. Schmiegelow, in a critical review of this subject, said that the after-treatment had not changed fundamentally up to today, and he looked on the tamponless treatment as dangerous. A noteworthy observation was that epidermization takes place rapidly and well in cases of erysipelas. In regard to asepsis he said that usual surgical rules should govern. Incidentally, Beyer introduced a self-retaining dressing speculum that holds the flaps in place and expedites treatment.

The least infection of the wound may destroy the young epidermis and cause exuberant granulations. Granulations, especially in the round window region, are dangerous for the hearing. Labyrinth irritation calls for removal of packing and treatment by irrigation. The author believes it necessary for every student to understand first the tampon treatment, but also its contraindications and the usefulness of the other methods under the proper conditions.

The Thiersch graft was first used by Sibenmann, two weeks after operation, through the postauricular wound, after curettage of the granulations. Vulpius used the Reverdin grafts. Eschweiler, used Thiersch grafts immediately, closing the posterior wound. Politzer transplanted as soon as the plastic flaps were adherent, using a perforated glass bulb as a carrier of the new skin, which was applied against the underlying surface by a rubber bulb blower. Welty, after thorough removal of all bone to the vitrea and careful curettage of all mucosa,

on the fourth day transplanted one flap over the tube, one on the median tympanic wall, the spur and the mastoid cavity, and the third on the attic and the antrum. On the eighth to the tenth day he removed the piece over the promontory to conserve the hearing. With and Israel used a wax impression of the cavity to hold the grafts in place. Pontopiddian reported excellent results using petrolatum gauze to hold the grafts. Forselles opposed the use of skin grafts. Jansen was at first in favor of them and later opposed them as did Wood. Altogether these grafts are used less than formerly, but they still have their value in covering a large cavity or in preventing stenosis in a very small one.

The original method of postoperative treatment through the retro-auricular wound, which was more convenient and less painful, led in many cases to the undesirable postauricular fistula, the "hole behind the ear." For this condition numerous plastic operations were devised by many operators; these are described in detail in this well illustrated article. They depend chiefly on an incision behind the auricle, separate mobilization of the periosteum and the skin (after excision of the scar), and separate suturing of these tissues in two layers to cover the defect.

Cyst formation in the cavity is treated by puncture and packing or powder. Narrowing of the canal occurs mostly after trauma to the soft parts. For this the author recommends the Passow method of celluloid tubes laid in after the widening of the canal by removal of granulations or ingrowing epidermis under local anesthesia. Others use various plastic operations. Neither of these is successful in marked cases, which require reopening of the retro-auricular wound and the use of pedicled flaps from the surrounding skin, combined with the dilatation treatment in the canal itself until epidermization takes place.

Stacke claimed that healing occurred in 94 of his first 100 cases. Grunert reported healing in 74.2 per cent of 200 cases, with 1 death due to operation; Dench reported healing in 131 of 193 operations, with 6 deaths not attributed to the operation. Borries reported 1,108 operations, with 10 deaths, and computed the postoperative fatal complications at 1.26 per cent. Late complications were rare. Fabry reported 1, Neumann 2 and Lange 1.

Recidives are of three types: (7) skin inflammations due to accumulation of epidermal débris or to remnants of mucous membrane producing secretion; (2) superficial caries of bone, with or without the recurrence of cholesteatoma, which can occur even under healthy epidermis, and (3) malnutrition or tuberculosis, which requires general rather than local treatment. The principal offender appears to be the open tube, but relapses occur when the bone is poorly nourished, such as in sclerotic mastoids, particularly when associated with cholesteatoma; for this reason, prolonged control of the wounds is necessary.

Histologic examination by Neumann has shown that in spite of apparently perfect epidermization the bony changes of chronic inflammation are still present in the form of high grade osteoporosis, with fibrous tissue filling the marrow spaces, the residuals of osteomyelitis. Even the labyrinth compact is affected.

In the most important sense the operation is radical in that it protects against intracranial complications, but it is not always possible to achieve definite healing of the cavity; therefore the view of Bruehl and Neumann that a wide meatus is desirable to allow proper observation of such after-treatment as may be necessary from time to time.

The next question concerns preservation of function. In answer to this, numberless statistics are quoted which lead nowhere as the criteria are not standardized. In general it may be said that the hearing depends on its condition before operation, on the possibility of a conservative operation and on the status of the window regions as to whether thin membrane or thick scar covers them after healing. In general, the better the hearing before operation the greater its relative loss. The prognosis is especially bad if nerve deafness supervenes. Schoenemann expressed the belief that the hearing is better conserved if the anterior portion of the membrana tympani can be left, and Neumann advised avoiding trauma of the middle ear so far as possible. Opinions are divided as to the effect of closure of the tube. Neumann called attention to the value of even slight hearing for binaural function.

Beyer expressed his belief that the plastic operation is a necessary adjunct to the radical operation, but acknowledged that the Bárány modification has its place. He believes that with primary closure of the incision transplantation also becomes unnecessary except in a few cases. He also thinks that most operators will prefer the old method of tamponade as a routine, but that more and more it will be used or omitted according to the experience of the operator. The end-results depend on the thoroughness of the operation, the resistance of the remaining tissues, the carefulness of the after-treatment and the healing proclivities of the patient. He quotes Neumann as saying: "the antrotomy as radical, the radical operation as conservative as possible."

Today, when one does not see many long-neglected cases, one has to a great extent lost the fear of choleasteatoma, but there still exists a little suspicion of the conservative radical operation, which the author believes will also disappear as one learns of better results from it. The cosmetic results with primary closure are also better. The author gives great credit and thanks to the pioneers who forty years ago worked out not only the operation, but the after-care so well that recent improvements are relatively few.

DISCUSSION

DR. LANGE: I was formerly opposed to the operation via the external canal but now am converted to this operation, which I do under local anesthesia. The operation is easier. There is less trauma, and good oversight of the operative area may be obtained. I use mostly the Thies chisel, and occasionally the bone forceps of von Eicken. I excise by two parallel incisions a piece of the soft canal wall. I sacrifice this as it is unnecessary for the epidermization of the cavity. By operating in this way one begins in the diseased area and continues until healthy bone is reached.

DR. LOEBELL: Aside from intracranial complications the radical operation is done only in chronic epitympanal suppurations, mostly cholesteatoma, in which there is no diminution in discharge or odor after ten consecutive daily irrigations of the attic. The probability of the patient receiving the necessary local care is also considered. Operation is done via the mastoid. I believe that the operation is undertaken too readily by those who operate via the canal. I prefer local anesthesia. The ossicles are usually functionless in the operative cases and are therefore removed, except in cases in which there is closure between the epitympanum and the mesotympanum. The membrana tympani is preserved to cover the eustachian orifice. I use the Uffenorde plastic operation, the Uffenorde glass speculum and boric epinephrine salved tampons, usually with healing of the cavity in from four to six weeks.

DR. THIES: I prefer the external canal route except in complicated cases. Except for the removal of adhesions and polypoid tissue, the tympanic cavity and especially the stapes region is left untouched.

DR. FREY: Careful and regular treatment leads to anatomic healing in many cases heretofore though incurable. Operation is indicated in chronic suppuration with widespread cholesteatoma and with general symptoms. Cases with slight cholesteatoma are suitable for local treatment, and operation is performed only for repeated recurrences. Cases without cholesteatoma, even with marginal defect can be treated conservatively for many years. The danger to life in these is slight. Cases with slight or with no cholesteatoma are suitable for the conservative operation.

DR. VOSS: In acute cases in which suppuration occurs three or four weeks after antrotomy there is usually suppuration at the apex of the pyramid and a radical operation is required. For poor epidermization I recommend treatment with the Kromayer lamp. Drops of a brand of epinephrine, followed by a drying powder are used for tubal suppuration following the radical operation.

DR. VON EICKEN: The operation via the canal is done in cholesteatoma cases with sclerotic mastoid, as shown by roentgenograms. Local anesthesia is used.

which occasionally causes a temporary facial paresis. I have given up the burr in favor of the Thies chisels. With the best of care, use of the burr in hard bone causes a caloric irritation of the labyrinth. The canal approach is safer and is the operation of choice.

DR. HINSBERG: I agree with Dr. von Eicken. I use stereographs to determine the type of mastoid. I recall when meningitis (postoperative) was the great bugbear; now fortunately it is greatly lessened through better understanding and handling of the labyrinth cases.

DR. OPPIKOFER: Perichondritis, which is usually a *Pyocyaneus* infection, is much rarer since better asepsis is obtained. However, if the suppuration is severe in cholesteatoma I prefer to defer the plastic operation two weeks.

DR. NEUMANN: I do not favor the external canal route. Most cases of meningitis are monobacillar; if the infection is polybacillar it is suggestive of further complications. Acute exacerbations may be impossible of diagnosis; they may lead to suppression rather than to an increase of discharge. When this occurs with fever the observer must be on his guard. I avoid all superfluous manipulation of the tympanic cavity. It causes cysts and scars, delays healing and injures hearing. The operation via the canal is for selected cases only, and must always be looked on as experimental.

DR. DAHMANN: It is an accidental matter whether the cavity becomes dry with the usual plastic operation. I have devised a spiral pedicled flap containing periosteum, which I lay in between the upper edge of the membrana tympani and the defect in the tegmen tympani, and with which I have had excellent results in appropriate cases.

RADICAL MASTOID OPERATIONS FOLLOWING THE METHOD OF BÁRÁNY, WITHOUT A PLASTIC OPERATION ON THE EXTERNAL CANAL. DR. ENGVALL.

The results hoped for from this operation are: (1) absence of the mastoid cavity, the canal being about the normal diameter; (2) in especially favorable cases, restitutio ad integrum; (3) less danger of perichondritis, and (4) simplification of the after-care.

From 1921 to 1927, ninety-five patients were operated on according to this method. A questionnaire brought in forty-one of these for after-examination. Of these forty-one cases, twenty had healed with normal or slightly retracted canals; ten had healed with the mastoid excavation restricted to the inner two thirds of the canal; eleven cases had not healed, and five of these had a cavity behind the canal wall which could not be observed through the meatus. Two cases required revision and a plastic operation, one because of recurrence of cholesteatoma with fistula in the horizontal canal, and the other because of recurrence of headache and continued suppuration of the wound.

REMARKABLE COMPLICATION OF RADICAL MASTOID OPERATION VIA THE EXTERNAL CANAL. DR. KUEMMEL.

For some time the author has preferred the operation via the canal according to Thies, and until this case he has been successful. This patient sustained injuries to both ears from a grenade explosion in 1917, with concussion. He was treated as an ambulatory patient, but hearing was never restored completely. In 1918 he was treated by the author for otitis externa, complicated by a desquamative process in the epitympanum with intermittent discharge. He was seen again in 1926 and 1927, when headaches began. In 1928, headaches recurred, especially on the left side, and there was pain in the left ear, without discharge. On January, 1929, he was found to have perforation in Shrapnell's membrane, but it was suspected that his subjective complaints were largely neurotic, and no examination of the labyrinth was made. Operation was performed via the canal, and a plastic operation

was done. Three days thereafter, fever developed, which was attributed to angina. Three days later, the temperature was normal, but there was continued pain; on the fourth day, there was a temperature of 40 C. (104 F.), a murmur at the apex of the heart and an enlarged spleen. The fever continued, and tenderness appeared in the parotid region, followed by swelling. On the following day a posterior auricular incision was made which disclosed a cavity insufficiently opened, extending downward and backward; the flap was a granulating mass; the sinus, which was covered by normal bone, was explored by puncture and culture, with negative results. Fever continued, with chills. The parotid was incised, disclosing a deep-seated abscess, into which a drainage tube was placed. The patient died eight days later, without evidence of intracranial involvement. Autopsy disclosed suppurative thrombophlebitis exclusively in both cavernous sinuses, and beginning meningitis in the left middle fossa. Both transverse sinuses were free. Other observations were: abscesses in the neck muscles, suppurative bronchitis, bronchopneumonia in the lower lobes, a septic tumor of the spleen and parenchymatous inflammations in the liver, kidneys and myocardium.

The author believes that sepsis was due to operation, and he quotes Boenningham, Hartmann and Oertel on fatal complications from canal furuncle. He believes that infection spread from the canal, via the lymphatics to the parotid; thence via the venae pterygoideus to the vena meningealis media. The route via the temporal bone and bone veins has not yet been excluded by microscopic examination, but there was no macroscopic evidence of it. It is possible that such an infection can ensue by infection of the plastic flap. Although this is the author's first fatal case following operation via the canal, he thinks it safer to limit this operation to those cases in which there are serious objections to the only seemingly more elaborate approach from behind the ear.

HEARING SENSATION UNITS AND HEARING AFTER THE RADICAL OPERATION AND AFTER ATTICO-ANTROTOMY. DR. C. RUF.

The author takes up the question of indications for and results of these two procedures in an article in which the reported cases are illustrated by graphs of the hearing and semidiagrammatic illustrations of the membrana tympani and the attic region in each case.

The principal indications for the conservative operation (attico-antrotomy) is the hearing. Hearing for the whisper of 1.5 to 2 meters, especially with positive results in the Gellé test, is considered an indication.

The poor functional results after the radical operation are traceable to the persisting active changes, especially in the medial tympanic wall, as shown by Neumann; these do not occur to any extent when the tympanic cavity is protected, as in attico-antrotomy.

The lower threshold for hearing after attico-antrotomy is lower than that after the radical operation; as a rule it is in the contra or subcontra octave. In order to be exact in these measurements it is necessary to consider the intensity of the sounds at the beginning of the test of each tone. Failure to observe this throws doubt on most of the published tests and claims.

PATHOLOGY OF OLD RADICAL OPERATION CAVITIES. DR. H. NEUMANN.

On the basis of histologic studies, years after operation, the author is of the opinion that the labyrinth is not protected against injury even in what appear to be well healed cavities. The degree of injury is dependent on the nature and the severity of the preceding inflammation, and the postoperative course through its effect on scar tissue is also an influence.

Late complications of dangerous degree are rare, but Neumann reports three: (1) a temporosphenoidal abscess, thirty-five years after operation; the cavity was covered by mucosa, which had suppurated especially in the region of the tegmen; (2) otogenic meningitis fifteen years after operation, via a granulating ulcerated

area in the tegmen; (3) meningitis nine years after operation; the tympanic cavity and antrum were filled with granulations.

In both the radical and the conservative radical cavities, even when they appear healed, changes continue to develop. Among these is cholesteatoma; the specimen shown reveals communication between the cholesteatoma-containing niche and the lumen of the tube. The cavity is clothed mostly with squamous epithelium, overlying connective tissue of varying thickness. Where the epithelium is lacking the connective tissue shows an inflammatory reaction with pus formation. In the window niches numerous cysts lie within the connective tissue. The horizontal canal wall shows fresh bone catabolism, showing numerous giant cells under the subepithelial connective tissue.

The spongy bone surrounding the labyrinth compact shows marrow spaces fibrosed, filled with dilated, blood-filled vessels, or with granulations which represent defects in the epithelium. In one place, under normal epithelium covering the tegmen, the bony layer is very thin, in one place even defective. The bony boundaries of the marrow spaces show a lacunar contour, evidently the result of erosion. The second specimen shows much the same changes; also in places, under normal epithelium, residuals of osteomyelitic changes that seem to have subsided. The third specimen shows the condition four years after operation; the operative area had apparently healed in two months. The promontory shows a lacunar defect, filled with fibrous connective tissue and numerous dilated vessels, but no giant cells. No changes are shown in the labyrinth, which explain the facial paresis and vertigo at the time of the operation four years before. The atrophic membrana tympani covers the stapes; the cavity is epithelialized, but the underlying bone shows the previously described changes.

The clinical experience and these histologic studies show that while many operative cavities remain in the condition hoped for, many of them in the course of years do not, but develop conditions that easily make for a recurrence of bony inflammation. There are two ways of explaining the recurrence of suppuration. If the epidermis overlies thick connective tissue, bacteria from the never sterile cavity may penetrate, especially if pressure of cerumen masses or water macerates the surface. If epithelium lies directly on naked bone, nutrition is poor and slight injury suffices to produce infection.

These facts show that the cavity is more or less constantly undergoing metabolism and reactions even under intact epithelium. These processes on the labyrinth wall explain the loss of hearing and, to a less degree, the labyrinth symptoms.

POSTOPERATIVE BRAIN PROLAPSE. F. FREMEL.

The author recognizes two factors: (1) a bone-dura defect, and (2) outward pressure. The latter is caused almost exclusively by encephalitis or increased cerebrospinal fluid, mostly by the former. In the presence of encephalitis, dura that has been merely punctured may break down, thus permitting prolapse of the brain. Small abscesses and well encapsulated ones seldom cause prolapse. In fact, it is unusual to experience immediate prolapse in any case of abscess on first opening the dura. Prolapse occurs when something further is added to the original abscess, and this is usually encephalitis; less often it is pus retention or another abscess. The author is skeptical of the value of any of the usual mechanical measures for removal or reduction of the prolapse, except when the underlying cause can be removed or spontaneous recovery occurs. The author therefore uses for exploration a needle instead of a knife to obviate the danger of prolapse as far as possible, although even then it may occur. After it occurs he believes in expectant treatment only, i. e., the application of nonirritating sterile wet dressing and avoidance of adhesions to the surrounding tissues, awaiting subsidence of the encephalitis, which the author believes occurs as often without surgical removal of the prolapse as with it. Active measures are justified only when the underlying inflammation has subsided and the prolapse still remains. In the Neumann clinic, prolapse occurred in fourteen of thirty-nine cases of cerebral abscess, and in

only two of twenty-four cases of cerebellar abscess. This is explained by the greater mobility allowed the cerebellum tissues by the cisternae, which are shut off from the cerebrum by the tentorium. In the fatal cases prolapse occurred in 40 per cent of the fatal cases and in 28 per cent of the recoveries, so that prolapse is not necessarily of fatal prognostic import. There is some parallelism between prolapse and choked disk. In fourteen cases with prolapse there were five with choked disk, while in twenty-five cases of abscess of the brain without prolapse choked disk occurred in only three. Histologic examination of a section of prolapsed brain showed parallel dilated vessels, puckered together at the point of opening in the skull; the entire mass looked like a hemorrhagic infarct, with the tissues undifferentiated by beginning necrosis, and granulations inseparable from those of the radical operation. The inflammatory edema extended throughout the corona radiata.

Although the patient may become apparently well, persistent prolapse is always a locus minoris resistentiae, which easily becomes infected, resulting in encephalitis.

PHYSIOLOGY OF HEARING: EXPERIMENTAL INVESTIGATION OF THE MECHANICS OF THE OSSICLES AND THEIR RESPONSE TO TONE AND AIR IMPRESSIONS. DR. DAHMANN.

Fresh unhardened cadaver preparations were used. The middle ear was dissected out from the inner and upper sides, without disturbing the membrana tympani, ossicles or intrinsic muscles, or the attachments necessary to function; a bridge of the inner wall was left, together with the fenestra ovalis and the articulation of the stapes footplate. The dissection was done largely with dental drills, the débris removed by gentle irrigation and damage to essential tissues avoided. It is believed that the mechanical conditions were sufficiently near those in the living subject to avoid serious error. Air pressure was not more than $\pm$ 60 mm. of mercury, and the tones used in the tests were within the normal stimuli as to strength and character. To register the amplitude and direction of the movements induced, a beam of light was thrown on the middle ear preparation, which was reflected by tiny mirrors fastened on the ossicles at the fulcrum and in the axes of movement. The preparation was then turned so that the reflected beams could be projected either on a screen or on sensitized paper on a kymograph. A series of preparations were made ranging from the isolated malleus-membrana tympani to the fully closed ossicular chain with its muscles and labyrinth attachment. A second series of experiments were made, beginning with the complete middle ear, and gradually removing one member after another.

Illustrations of the specimens are given, and their preparation described in detail. The article is further illustrated by reproductions of the projections on the sensitized paper resulting from the various ossicular movements, and by diagrams and mathematical calculations covering them. The factor of error is discussed, but these calculations are to be gone into more in detail in a later work. While there may be errors in the mounting of the mirrors, the pictures obtained are correct in relation to each other, and therefore permit conclusions being drawn.

The ossicles respond to both low and high tones, even to the very high whistle, with measurable movement. All the ossicles move in several planes, but one principal plane predominates; this is an in-and-out movement for the malleus and incus, which swing around a common axis. With a sufficiently strong impulse, side movements can also be determined. In addition, ossicular movement is influenced in certain directions by the intrinsic muscles of the ear. The same strength of impulse causes greater outward than inward rotation of the ossicles. This applies to both air pressure and tone vibrations. If the ossicular chain is intact, the impulse of both air pressure and tone vibrations diminishes in transmission from the malleus over the incus to the stapes. If the chain is disconnected from the labyrinth, both malleus and incus rotate to the same degree, even with rather strong impulses; marked movement of the membrana tympani transmitted to the malleus does not move the incus to the same degree.

So long as the vibrations are small enough (mild stimulation) to permit the stapes to follow the movement, and so long as the connections between the ossicles are firmer than the articulation of the stapes in the oval window, the chain swings as an intact mass. The lessening of the amplitude in transmission from the malleus to the stapes in the intact chain is not explained by the law of leverage; otherwise, when the chain is disconnected from the labyrinth the incus should show some diminution from the movement of the malleus. The lessening of the axial movement angle in transmission from the malleus to the stapes can be explained only by resistance in the tensed chain, which is equalized by the elastic connections of the ossicles.

In the transmission of more powerful impulses, the chain of ossicles does not act as a closed solid mass.

The graphs of various tone pictures show that the movement is wider for Ah, O and U than for the bright tones E and long A (German E). This is in keeping with the known necessity for an intact middle ear for perception of dull low tones. It is also shown that the plane of vibration changes with the character of the tone. Certain combinations of vowels, AO, AE and OU, bring about the greatest excursions of the ossicles. This is in keeping with the experience with hearing tests and the carrying power of singing tones.

Changing intensity of sound causes no change in the plane of the excursions, but increases their amplitude only.

The functions of the tensor tympani are: tension of the membrana tympani and the chain of ossicles, thereby decreasing amplitude and tone intensity; regulation of the plane of movement of the malleus, in the sense that it partially inhibits side movement, and a probable influence on the fundamental tone of the tympanic membrane itself.

The stapedius also tenses the ossicular chain, and in this sense is considered a synergist of the tensor tympani.

Proof of the fitness of the construction of the ossicles and their articulations for their function is shown in the registration of their movements.

The optical kymograph permits clear graphs to be made of both the pars tensa and the malleus during vocalization. Whether or not these satisfy the demands of scientific proof requires further investigation. They require investigation of the type and capacity of vibration of the membrane, of its fundamental tones, and of how far these tones are responsive with the proper periodicity.

The aforementioned calculations of the graphs and the vocal pictures furnish information as to the axial rotation of the ossicles, the amplitude of their movements; i. e., the chords of their arc of movement at the tip, which represents the length of excursion.

AMERICAN BRONCHOSCOPIC SOCIETY

Twelfth Annual Meeting, July 6, 1929

CHARLES J. IMPERATORI, M.D., *President, in the Chair*

CARDIOSPASM. DR. CHARLES J. IMPERATORI.

This article appears in full in this issue, p. 178.

DISCUSSION

DR. GABRIEL TUCKER, Philadelphia: Dr. Imperatori has asked that we depart from the usual custom and discuss his presidential address. I feel that his masterly presentation of the subject commands the highest praise, and I have no discussion to offer. I have, however, an endoscopic hydrostatic dilator that I have demonstrated to Dr. Imperatori and wish to present under new instruments to the society as an addition to the instrumentarium for the treatment for so-called cardiospasm.

AN ENDOSCOPIC DILATOR FOR STRETCHING THE HIATAL ESOPHAGUS IN PREVENTRICULOSIS (SO-CALLED CARDIOSPASM). DR. GABRIEL TUCKER, Philadelphia.

The safest method of dilating the stenosed area in preventriculosis is the introduction, by sight, of the distally lighted beveled tip of the Jackson esophagoscope through this area. Direct inspection of the narrowing ulceration, infiltration or cicatricial stricture would contraindicate "stretching" as the term is used in the treatment for this condition. When the contraindication to dilatation is eliminated, the simple passage of the esophagoscope will give sufficient dilatation in a certain percentage of cases to effect a cure.

Blind methods of introduction of the dilator are often ineffectual even by the aid of a string and fluoroscopic guidance. Fatalities have been reported following these efforts. Recently, retrograde dilatation through a gastrostomy wound has been successful in a group of cases in which string-guided methods of introducing the dilator have been unsuccessful (Judd, E. S.; Vinson, P. P., and Greenlee, D. P.: Retrograde Dilatation of the Esophagus for Cardiospasm, Surg. Gynec. Obst. **48:** 494 [April] 1929). The idea of endoscopic dilatation is not new. Mosher's mechanical endoscopic dilator has been in use for many years (Jackson, Chevalier: Peroral Endoscopy, St. Louis, Laryngoscope Company, p. 42).

The instrument consists of a dilating bag similar in construction to the Plummer bag, two rubber and one silk cylindric bags—an inner and an outer rubber bag

The endoscopic dilator for the treatment for so-called "cardiospasm." Air or water pressure, either as desired, may be used for dilatation.

with the silk bag between them. The distal ends of the bags are fastened to a rounded metal tip that is permanently attached to a slightly flexible metal rod that passes inside the inner rubber bag and is fastened to the distal end of a metal tube of 6 mm. by a hub and spoke attachment. A groove on the circumference of this end of the tube also serves for the attachment of the proximal ends of the bags. This allows the dilating medium, air or water, to pass freely and quickly from the metal tube into the dilating bag, or vice versa.

The length of the metal tube is 65 cm.; that of the dilating bag, 7 cm.; the length over all is 73 cm., and is scaled for esophagoscopes of both 45 and 53 cm. A pressure manometer and release valve are attached to the air or water pressure supply tube for the control of pressure. The dilating apparatus, when deflated, will pass easily through a 9 mm. full lumen tube.

The esophagoscope (9 × 53 mm. full lumen) is passed through the hiatal esophagus into the stomach with the patient in the high-low (Jackson, Chevalier: Peroral Endoscopy, St. Louis, Laryngoscope Company, p. 193) position. The use of the C. L. Jackson esophageal evacuator (Jackson and Coates: The Nose, Throat and Ear and Their Diseases, p. 1000) quickly and effectively empties the enormously dilated thoracic esophagus and avoids the difficulties usually encountered in esophagoscopy in these patients. After the esophagoscope has passed into the stomach, the dilator is introduced to the first "53" mark from the distal end; the esophagoscope is then withdrawn to the second "53" mark from the distal end, leaving the length of the dilating bag beyond the end of the tube within the hiatal esophagus. Pressure (from 10 to 15 pounds [4.5 to 6.9 Kg.]) is then used under guidance of the manometer. The dilatation can be maintained as long as desired—

from three to five minutes (Imperatori, C. J.: Cardiospasm, Arch. Otolaryng., to be published).

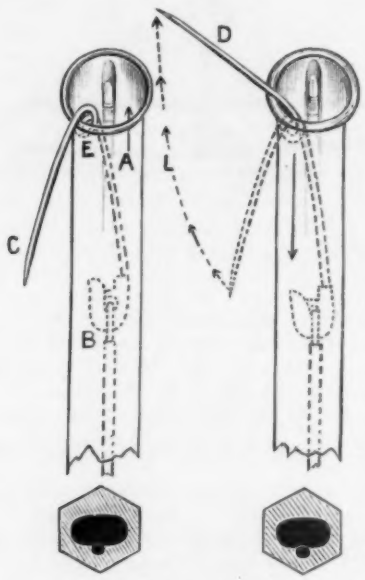
The thumb valve is then released, the bag is allowed to collapse and the dilator is withdrawn through or with the esophagoscope, as the operator desires. Repeated dilatations can be carried out as indications arise.

DISCUSSION

DR. C. J. IMPERATORI: I feel that the Plummer Mosher method of dilatation for relief from cardiospasm is the one that will give results. The majority of our patients on whom dilatation was performed in the recumbent position did not respond the way those in the upright position did. Sustained dilatation from three to five minutes with a large sized Plummer bag, such as that shown on the screen and having an hourglass-like contraction, usually cured patients in from one to four dilatations. I think that the method of direct inspection and placement of the instrument suggested by Dr. Tucker is a good one.

A SAFETY-PIN ESOPHAGOSCOPE. DR. GABRIEL TUCKER, Philadelphia.

One of the sixteen endoscopic methods of removal of a safety-pin from the air and food passages as described by Jackson is the intragastric straightening of the pin (Jackson, Chevalier: Bronchoscopy and Esophagoscopy, ed. 2, p. 251). In the cases in which this method is applicable, it is desirable to have tubes greater in



A safety-pin esophagoscope.

the lateral than in the anteroposterior diameter so that the keeper of the pin will slip easily into it, and the tube should be small enough anteroposteriorly to avoid undue compression of the trachea. The tube is beveled on its shortest diameter and is of the Jackson type. It should be used with fluoroscopic guidance in the anteroposterior plane, so that the operator can be certain that the pin has been passed into the stomach before straightening is attempted.

AN UNUSUAL FOREIGN BODY. DR. CHARLES J. IMPERATORI.

This article appears in full in this issue, p. 213.

DISCUSSION

DR. SIMON JESBERG: I am interested in Dr. Imperatori's report on the razor blade. I had an insane patient who swallowed half of a Gillette safety razor blade, which lodged in the thoracic esophagus at the level of the aorta. An expanding esophagoscope was improvised by sawing lengthwise a heavy Lynah esophagoscope from the distal end to within 5 cm. of the handle. The dividing portions of the tube then spread by themselves so as to increase the lateral measurement at the tip more than 100 per cent. A flat band attached to a wire held the two parts together. After the introduction of the tube the wire was drawn up, thereby permitting the tube to expand sufficiently to encompass the razor blade, and then the tube and blade were removed together without trauma in the esophagus.

I was impressed that the patient had caused no trauma in the act of swallowing the blade.

DEMONSTRATING BRONCHO-ESOPHAGOSCOPE. DR. CHARLES J. IMPERATORI.

This article will be published in full in the March issue of the ARCHIVES.

MASSIVE ATELECTASIS: REPORT OF A CASE. DR. HARRY L. BAUM, Denver.

Dr. Baum reported a case that seemed unusual to him. He was called by telephone from Albuquerque two weeks before presentation by a physician who stated that he had a patient with massive collapse of the lung on whom he wished Dr. Baum to do a bronchoscopy. It was impossible for Dr. Baum to go to Albuquerque, but the physician said that he was going to send the patient to him, as the patient was ambulant. The diagnosis was immediately doubted. Dr. Baum said that he had never seen a patient with that type of collapse who was not in a rather precarious condition. However, the patient came and when she was seen Dr. Baum was much surprised to find by the excellent roentgenograms that she brought with her and also from the history of the case that there was no question but that she had had massive atelectasis for a month. She was apparently well physically; her pulse rate was about 100; there was a little shortness of breath on exertion; there was no fever, and she felt better generally than she had before the collapse occurred. The history was as follows:

Mrs. Pulliam, aged 27, married, had had no children, although she had been married for three years, and there was no pertinent history, either for herself or for her husband. She had an illness at the age of 10 which she said was severe bronchopneumonia on the right side. Since then she had had what was called "asthma," but which I think was an asthmatoid condition, because she has never had asthmatic paroxysms, but simply wheezing at all times. She had also occasionally had pleurisy on the right side. She had gone to Albuquerque about six months previously on account of her health, having developed what was thought to be mild tuberculosis, as diagnosed by the roentgenologic and the physical observations, but not by the finding of tubercle bacilli in the sputum. She was thin and not strong, but was not acutely ill until this attack.

One month before she was seen, while in the mountains, she had suddenly, within twenty-four hours, developed the collapse. She had, of course, suffered from embarrassed breathing and rapid pulse rate, up to 140. She was taken to Albuquerque and placed in bed for two weeks, during which time she was watched and studied by some excellent specialists for diseases of the chest, and a diagnosis of collapse was made from the physical and the roentgenologic observations. Her temperature at no time exceeded 99. She had slight cough with expectoration. The roentgenographic and physical observations were checked after her arrival in Denver, and there was no question as to the diagnosis of massive atelectasis of the right lung.

Illustrating the observations on the chest, figure 1 shows the chest before the collapse. In studying this patient when she was first reported, her physicians fortunately took roentgenograms of the chest, which showed considerable evidence of tuberculous activity in the upper lobe of the right lung and some in the left

Fig. 1.—Roentgenogram taken six months before collapse of the lung occurred. There is evidence of slight tuberculous activity in both upper lobes, especially the right. Heavy fibrosis in the hilar regions and small areas of fibrosis throughout both lungs are visible.

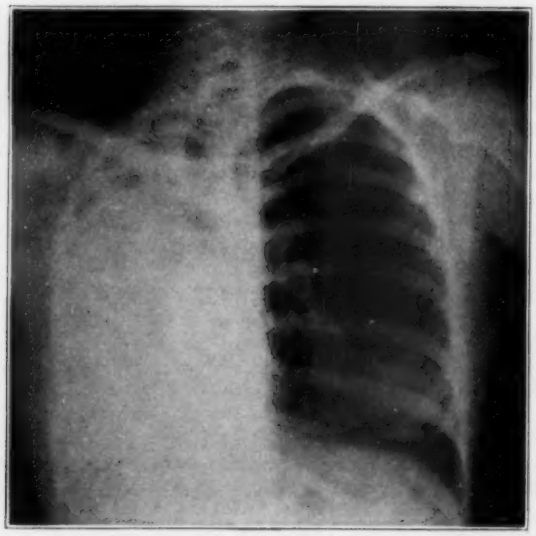


Fig. 2.—Roentgenogram taken immediately after collapse occurred. There is complete collapse of the right lung; the heart is moved over into the right side of the chest with overexpansion of the left lung.

lung. There was heavy fibrosis in the hilar region and some areas of fibrosis throughout both lungs. The bronchial condition could not be defined; the mediastinal shadow was somewhat thick to the right (fig. 1). Figure 2 shows the condition after the collapse occurred and is the typical picture of complete atelectasis of the right lung, with the heart moved over into the right side of the chest and overexpansion of the left lung.

Bronchoscopically, stenosis of the right main bronchus was observed, starting just below the carina. The wall of the bronchus was covered with a whitish purulent exudate which scaled off easily. The stricture was annular and was about 4 mm. in diameter. There was no pus exuding from the bronchus. An aspiration tube could be passed through the stricture, and about 1 drachm of mucopurulent secretion of the same character as that coughed up was aspirated. Roentgenograms taken after bronchoscopy showed no improvement in the condition of the chest. The observations on the blood and the Wassermann reaction were negative, and the white and red counts were normal. The purulent material aspirated was positive for tubercle bacilli, but not in large numbers. There were no other important observations and nothing to indicate sepsis. There was no history of foreign body.

Dr. Baum's impression was that this patient had a stenosis of the right main bronchus dating back to the time she had pneumonia at the age of 10, seventeen years before the collapse occurred; that her so-called asthma was due to stenosis and was really an asthmatoid wheeze, and that the collapse was probably due to a gradual accumulation of secretion plugging the stenotic bronchus and possibly the bronchi lower down.

Bronchoscopy and aspiration apparently did not result in immediate benefit, but further observation was advised with attempts at dilatation and aspiration at definite intervals. This is the first time that Dr. Baum had seen massive collapse, the mechanism of which could not be explained and which did not show evidence of sepsis after having been present for a prolonged period. The patient was ambulatory and had had the condition exactly one month when he saw her.

DISCUSSION

DR. THOMAS E. CARMODY: This case was interesting to me because Dr. Baum spoke to me about it when he first had the telephone message, and we could not understand exactly how it could be massive collapse, but this was explained after he found that there was collapse of the bronchus.

I had one case that I will speak of in my paper, in which there was massive atelectasis, partly due to plugs in the bronchi, where one bronchus was apparently compressed by an enlarged peribronchial gland. There is a possibility that this might have occurred in Dr. Baum's case, but did not show in the roentgenogram because of the entire exclusion of air. In my case, the condition followed pneumonia, and massive atelectasis occurred on the street after the patient had apparently recovered from pneumonia.

SYMPOSIUM ON PULMONARY ABSCESS FOLLOWING TONSILLECTOMY

PULMONARY ABSCESS FOLLOWING TONSILLECTOMY: LARYNGOLOGICAL ASPECT. DR. THOMAS E. CARMODY.

MEDICAL ASPECTS OF POST-TONSILLECTOMIC PULMONARY ABSCESS. DR. PHILIP H. PIERSON, San Francisco (by invitation).

PULMONARY ABSCESS FOLLOWING TONSILLECTOMY: BRONCHOSCOPIC CONSIDERATIONS AS AN AID TO THE SURGEON. DR. LEROY A. SCHALL.

PULMONARY ABSCESS FOLLOWING TONSILLECTOMY: BRONCHOSCOPIC CONSIDERATIONS. DR. LOUIS H. CLERF.

THE POST-TONSILLECTOMIC PULMONARY ABSCESS: FACTORS IN HEALING. DR. EMILE HOLMAN, San Francisco (by invitation).

The papers by Drs. Clerf and Carmody appear in full in this issue, pp. 192 and 200, respectively; the other three will be published in the March issue.

DISCUSSION OF PAPERS ON PULMONARY ABSCESS FOLLOWING TONSILLECTOMY

DR. GEORGE L. RICHARDS, Fall River, Mass.: I have been intensely interested in this symposium. During a period of thirty-four years, I have had four cases of abscess in connection with tonsillectomy. One was a case of virulent pleurisy in which no pathologic examination was made; the operation of rib resection was performed at a private house, with prompt recovery. The purulent material smelled like an infection from colon bacillus, but it may have come from some embolus.

One thing was brought out clearly by Dr. Clerf, namely, that the statistics given out by the specialists on diseases of the ear, nose and throat at the hospitals may be misleading because we do not know the after-history of so many patients. The patients may go to some other hospital, or they disappear. The only case I have had that resulted fatally I did not know anything about until eight months after the operation. The patient was a nurse in our own hospital. She went back to work, was not very well and was seen by an internist, who made a diagnosis of bronchitis with possibly a little cardiac trouble. She had that when she came to the hospital as a pupil nurse. This occurred in my own hospital, under my own eyes, and I knew nothing about it. Eventually, a diagnosis of abscess of the lung was made. An attempt was made to find the abscess surgically, without avail. The patient was sent to Dr. Jackson's Clinic, and they had to do a number of bronchoscopies. She came back to our hospital and improved somewhat, and after more bronchoscopic evacuation of the abscess the patient improved and went back to work, but in a few weeks she began to get worse, and at the end of about two years she died. Whether the cause of failure was that the abscess was not discovered early enough, I do not know. I think the point has been made by one or two that when the specialists for diseases of the nose or throat who are good bronchoscopists find an increase of temperature, even slight, following a tonsillar operation, the possibility of abscess of the lung should be considered. The trouble is that as a rule the patients do so well that we get careless.

The third case was in an adult, who was operated on by external surgical intervention; the abscess was discovered, and the patient recovered.

The fourth case was that of a child in whom abscess was discovered fairly early. I did the operation on the tonsils and did not know anything about the abscess until weeks afterward. The first thing I knew the child was in the hospital for an operation for abscess of the lung by a general surgeon, who used local anesthesia. The child recovered after a stormy convalescence.

I have done thousands of tonsillectomies and these are four cases, over thirty-four years, in which I feel that I was probably the culpable agent.

How can we get rid of these cases? There are many cases not reported, and I think that if anything should go out from both the triological and this society it is that an operation on the tonsils is far more serious than is generally conceded.

As to the question of anesthesia, in the west these operations are done under local; in the east, we are more inclined to use a general anesthetic. So far as I have noted, the mortality, either from abscess or from hemorrhage, seemed to be about the same, and Dr. Clerf showed that more deaths occurred under a local than under a general anesthetic. In the case I recorded, in the child, the only cause we could find was that the suction apparatus was not working well and some septic material might have been inhaled.

So far as the etiology is concerned, I think that the aspiration theory takes precedence over embolism.

DR. EDWIN MCGINNIS, Chicago: I had the good fortune to perform a bronchoscopy on a patient, a woman, about 35, whose bronchoscopic picture was interesting. She had had a tonsillectomy done under general anesthesia. I

reported this case in a paper before the American Laryngological Association three years ago. The notation as to the pathologic condition of the tonsils was that the crypts were full of necrotic material, some of which was squeezed out into the throat during the tonsillectomy. So far as the operation was concerned, the crux of the situation was that there was so much bleeding after the tonsillectomy that the patient was taken back to the operating room and the pillars of the tonsils were sutured to stop the hemorrhage. She developed untoward symptoms following tonsillectomy—a rise in temperature, some pain on the left side of the chest and a nonproductive cough.

I saw the patient about a month after the onset of the fever, and it was interesting to me that even though the patient had a good deal of cough which was nonproductive, there was no odor from the expired air. The roentgenogram showed involvement of the lower lobe of the left lung. When I passed the bronchoscope under local anesthesia, the right side was clear; there was no odor of untoward material in that bronchus. On the left side, the upper lobe was clear and there was no odor, but as I passed the tube down I came against a dark colored plug that completely occluded the lower lobe of the left bronchus. I used an ordinary Jackson aspirator, passed down the bronchus aspirated through the tube and as soon as the plug was removed I got some odor. The bronchoscopy was done in the morning, and late in the afternoon the patient began to have a productive cough. We kept up the bronchoscopy weekly for five or six weeks, and the patient made a fairly good recovery. But the physician who did the tonsillectomy was a general surgeon, who was desirous of using surgical intervention to help in the cure of this patient. He finally did a rib resection, and an interesting notation on the chart was that he did not find cavity formation in the lower lobe, but when pressure was made on the lower lobe with the finger the patient coughed and expectorated a plug of material. Following the rib resection, there was no drainage from the wound, and the patient made a good recovery.

Dr. Burt R. Shurly, Detroit: This is a subject of great importance to the laryngologist. It interests everyone because we never know when our turn will come to meet some of these complications. For many years it has been a method with me to operate on all patients under general anesthesia on the side with the head somewhat lower than the feet. I have carried out this procedure for more than thirty years. To my knowledge I have never had a case of abscess, but just as one of the physicians said, these cases pass beyond the observation of the special hospital into other hospitals, and there does not seem to be the usual courtesy that one might expect—that the operator be called up and notified as to the complications that result. I think that that would be a fine courtesy if we would pass it around—to let the operator know what had really happened to his patient.

It would seem to me that the aspiration theory is the more reasonable, because the amount of septic material that is necessarily inspired under all the various difficulties of anesthesia is a frequent cause of this condition. In the old days of chloroform, the increase of pulse rate was much less, although the danger was increased. Operating for respiratory infection in the presence of a rise in temperature carries with it a great responsibility. It seems to me that if one third of all the operations in the hospitals of the United States are tonsillectomies, as has been reported by some observers, we have the most important subject in the world to consider at the present time. The operation is performed, not by experts as it was perhaps a decade ago, but it is now in the hands of everybody—pediatricians, general surgeons, general practitioners, those who have had a very short course in surgery and almost all the interns in the hospitals are now doing tonsillectomies—and I believe that the contraindications should be emphasized and safeguards thrown out much more extensively than they are. The operation in these cases in the presence of active tuberculosis does not seem to be sufficiently guarded. The administration of ether in the presence of acute pulmonary tuberculosis in its incipient stage is one of the things that should be avoided if possible.

The after-care of patients who have undergone operations on the tonsils, it seems to me, is not sufficiently understood or the dangers realized. We do so

many of these operations in which the patients get along well that in a majority of cases we do not realize the danger.

I have always advocated conservative methods, and I think that the bronchoscopic method is conservative and a successful way of adding to the drainage. It seems to me that the external surgical route should be carried out only after other methods have failed.

Relative to the bronchoscopic considerations, I think that there is nothing to add to what Dr. Schall and Dr. Clerf have already said. There is a point, however, that has been striking to us in the treatment of these patients surgically, medically and bronchoscopically, and that is, when is the patient cured? The increased susceptibility to reinfection is important. We have observed a number of cases in which the roentgenologist and the internist, after examination, found that there was no further evidence of disease of the lung and the patient was discharged and sent home as well. In the course of two or three months, following an acute respiratory infection, he has returned with the symptoms of pulmonary abscess. If the patients who have apparently recovered from pulmonary abscess could be placed on a regimen similar to that in use in cases of tuberculosis of the lung, with rest and outdoor life for six months after the infection in the lung, there would be less danger of this reinfection.

In Dr. Jackson's bronchoscopic clinics in the Graduate and University Hospitals, Philadelphia, all patients with abscess of the lung under bronchoscopic treatment are given careful medical observation and care. Postural drainage, rest in bed, abundant diet, open air and sunshine are a part of the routine measures. The use of morphine and sedatives for cough that impair normal bronchial drainage is avoided.

Dr. Joseph C. Beck, Chicago: I hesitate to take part in this discussion because I have never had a case of abscess; this is not said in a bragging way, but perhaps I have been fortunate.

I shall discuss the points that have been made about infection around the teeth and in the contents of the crypts of the tonsils, so far as *Spirochaeta dentium* is concerned. So often in tonsil cases patients have bad teeth also, which fact is not sufficiently taken into account. Many physicians in general practice advocate a tonsillectomy and pay no attention to the teeth. I wonder if the tonsils could not be treated preoperatively, not for weeks and months, but if the crypts contain not streptococci but cholesterin and a great deal of material that is found around the teeth, this could be removed before operation.

A few years ago Dr. Clendening of Kansas City condemned the use of the suction apparatus in connection with tonsillectomy, when he reported a case in which subsequently they removed a tooth from the lung that had lodged there owing to suction. After that, at a meeting in Philadelphia, Dr. Gwathmey made the statement that it was pure negligence for any one to attempt a tonsillectomy without a suction apparatus. I do not think that with general, or even with local, anesthesia with the patient in a recumbent position one can do an operation without the use of suction apparatus, and I believe that its use will prevent a great deal of this trouble.

Dr. Francis L. Rogers, Long Beach, Calif.: I have been greatly interested in the discussion of this subject, never having seen or known of a case of abscess of the lung developing in my own work in thirty-seven years' practice. I have wondered sometimes why, in a fairly busy practice, it has never occurred, and I feel that perhaps it is partly due to technic. It seems to me that a little care might be exercised in cases that appear to be unusually infectious. While in London last year, I saw a number of operations on the tonsils in the London University Hospital, with the patients in a different position from that which I think is generally used in this country. I thought that it might be interesting to some of you to know that they tilt the patients, after they are anesthetized, to an angle of almost 45 degrees and operate from behind, using an apparatus that is attached across the chest to hold the mouth open, and as they operate they look down into the mouth. As the drainage is from the lung, it seemed to me that this would

reduce to the minimum the possibility of infection getting into the lungs. The nose is more or less filled, but the field is clear and the opportunity to see the larynx in that position is excellent.

I noticed that Dr. Shurly spoke of another position which I have used a good many times, that is, the position with the patient on the side.

It seems to me that general anesthesia has a place in tonsillar surgery in adults when, and only when, local anesthesia is contraindicated. That is my practice, and I believe that if one is reasonably skilful in the application of local anesthesia it is preferable in adults. I have removed the tonsils from a boy of 8 under local anesthesia.

Dr. Marvin F. Jones, New York: Owing to the criticism of the surgeons in regard to the work on the tonsils at the Manhattan Eye and Ear Hospital, they have organized a system of inspection which they hope will produce better results, so that I think in the future we shall be able to tell something more about abscess of the lung. I can recall the cases of only two or three patients operated on in the hospital who came back to us. We have had the experience that has been mentioned here — we never hear of these cases. With this new system of inspection, I think that we shall have reports that will be profitable.

I should like to ask Dr. Clerf whether, in these cases of abscess of the lung, he does not find many in which he cannot find the opening. Dr. Law is wonderfully dextrous, and can see the pus bubbling around but has not been able to find an opening, and he believes now that it is almost impossible to find an opening.

Dr. Henry T. Bailey, Phoenix, Ariz.: I do not know that I can add anything to the discussion, but I should like to say that in my practice I have seen only one pulmonary abscess following an operation. That was in 1918, at the outbreak of the influenza epidemic. At that time we knew nothing about influenza — do not know much yet — and I hardly know whether this abscess came from the attack of influenza, or whether the influenza was coming on at the time we operated. At any rate, a large abscess in the lower lobe of the right lung was later operated on by a general surgeon.

I have traveled about the country a good deal and have watched different physicians do operations on the tonsils, and I have gained a few ideas. First examine the patient carefully before operating — tonsils, teeth, mouth and chest — and if the patient has any degree of fever, do not operate.

I learned from Dr. Joseph Beck years ago to hold up the soft palate. By running a catheter through the nose, bringing it out through the mouth, if the catheter is clamped, the soft palate can be pulled any way. It gives a full view of the pharyngeal fossae to watch the hemorrhage. Another thing, if I see bits of detritus squeeze out when I grasp the tonsil, I stop the operation long enough to remove them before proceeding.

If we were to obtain statistics of tonsillar abscesses throughout the country we might report more than really exist. This is exemplified in the case of a patient who came under my care two years ago — a woman who had been operated on in Nebraska. She developed pulmonary abscess, and not being satisfied with the treatment in Nebraska went to the Mayo Clinic, where they washed out the abscess once or twice. Then she went to the Jackson Clinic for treatment, after which she came to Arizona. On going over the history carefully and looking at Dr. Jackson's observations, I decided that bronchoscopic treatment was not indicated and that the abscess was clearing up. We depended on our Arizona sunshine, and after taking this sun treatment she is now well.

Dr. John F. Barnhill, Miami Beach, Fla.: I have had just one case of abscess of the lung, so far as I know, in forty years. If I had that operation to perform again, I cannot conceive wherein I could make a change in technic. The patient was a woman teacher in one of the eastern universities, who came home on her summer vacation. She was given a thorough, not a routine, examination; her throat was prepared in the way of sterilization, and she rested in bed for several days. The operation was performed under local anesthesia, procaine hydrochloride, without pain, and with considerably less bleeding than usual. About three days

later, she had several chills and a septic temperature and died within ten days. Postmortem examination showed miliary abscesses throughout the lung. I am convinced that circulatory abscesses, that is, a hematogenous infection, may occur in many of these cases, and do occur in some of them, though one works as carefully as I did in this case.

DR. HARRY L. BAUM, Denver: It impresses me that two important factors are involved in the ordinary aspiratory type of pulmonary abscess or gangrene following tonsillectomy. One is aspiration of infected material; the other is the plugging of a bronchus and the collapse of a portion of the lung. Despite careful preparation, as well as careful operative technic, it has been shown by the studies of many men that aspiration of blood follows a large percentage of tonsillectomies under either local or general anesthesia, and I know of no method for preventing these abscesses except to check carefully after every tonsillectomy. I think that it is generally admitted that every tonsillectomy is potentially a case of abscess of the lung. If these patients are told to report back or are checked up by the social service worker, we shall be able to note cases early, and I believe that if we can see these patients early when the symptoms are beginning and subject them to bronchoscopy for the removal of plugs of infected material and blood, we can probably shorten the convalescence and possibly prevent the formation of abscess. We know that the ordinary foreign body which occludes a bronchus does not result in the formation of a typical abscess of this type, and we know that a foreign body of the dental type, especially a tooth, is likely to result in the formation of this type of abscess. The simple plugging of the lung is not sufficient for the development of gangrene. It is necessary to have in addition the presence of the spirochete and fusiform bacilli from the teeth and mouth which are seemingly essential to the development of this particular kind of pathology, which is really gangrene and not true abscess. So it seems to me that early aspiration, early removal of the plug, would facilitate drainage and aeration of the area and thus prevent the more serious sequelae of this type of complication.

DR. W. F. VON ZELENSKI, Fort Eustis, Va.: I think that perhaps I have been more unfortunate in this respect than some of those who have spoken this morning. Late in 1925 and early in 1926, I had five cases of abscess of the lung. Four of the patients were operated on under general anesthesia and one under local. They all were given thorough physical examinations, the last one particularly because of the history. The patient, a woman, of somewhat slight build, was brought into the hospital four or five days before operation. Roentgenograms were taken of the chest, and everything possible was done; the operation was not particularly difficult, but seven or eight days afterward she manifested symptoms of abscess of the lung. It was remarkable that all of these patients recovered spontaneously. They were put to bed and treated as patients with acute conditions of the lungs, no surgical treatment being undertaken; the abscesses drained spontaneously after a certain length of time.

In trying to search for the reason, I found that my technic was no different than it had been in other cases. I remember having had but one case of abscess of the lung previous to that time in ten years, and that case followed the opening of a peritonsillar abscess. I concluded that there was some infection in the hospital at that time that had a predilection for that kind of case, so I resolved I would do no more tonsillectomies for a time. After eight weeks, I resumed operations with the same technic, and in 40 or 50 cases I did not have a recurrence, nor have I had a recurrence since in probably 150 cases. The thought occurred to us that perhaps some respiratory infection was floating around, and we likened it to the complication of mastoiditis or pneumonia so frequent in measles. Some patients with measles will have pneumonia, some will have mastoiditis, some will have both and still others will have no complication. I have not heard the epidemic form mentioned, but I think that this particular series came close to being the epidemic form of abscess of the lung.

DR. THOMAS E. CARMODY: Dr. Baum has suggested the possibility of unplugging the bronchus by aspirating early; two of the cases I had were unplugged early.

They were simple cases of massive collapse; one was not a complete collapse, but a collapse of two lobes. I believe that we prevented pulmonary abscess in one case. I think that is the thing that should be brought out, that if bronchoscopy is done in these cases early we will prevent abscess. Bronchoscopy should be performed on any patient who develops symptoms following tonsillectomy, unless there is some contraindication.

We have had four good papers in this symposium, and I enjoyed them very much. The one of Dr. Holman I enjoyed because I have read some of his articles, and while he leans toward the embolic theory and most of us lean toward the other theory, that is no sign that he is not correct. Of the papers published — about fifty-five that I consulted — there were forty that leaned toward the aspiratory theory. In the two cases I spoke of, one patient was recovering from pneumonia ten days after an appendectomy; in the other, the atelectasis seemed to follow recovery from pneumonia.

Dr. Rogers speaks of his position. We use a semi-Trendelenberg position, and think that we are preventing abscesses, although Dr. Phelps suggested that the reason we had abscesses of the upper lobe was probably because the upper part of the lung is dependent.

My statistics contradict those of Dr. Clerf. We had fewer cases in women and children, while in their series they had more women than men.

I do not think that we should lean toward radical measures, whether surgical intervention or bronchoscopy. We should not be too conservative, but we should be rational, trying to see all sides of our cases, and decide whether surgical intervention or bronchoscopy, or a combination of the two, should be used.

Plugs from the tonsils are taken care of by the aspirator and thus are prevented from getting into the chest. However, we may get plugs from sinuses that are not seen, but may be aspirated. This was evidenced by five of six cases of massive atelectasis following infection of the sinuses. A peculiar thing is that in the aspiration of these cases even if the plug is not seen, one can feel it hit the aspirator.

Of course, it is understood that these patients had preoperative care. In our cases, we always take care of the teeth, have them extracted or cleaned up, and when we can we aspirate plugs from the tonsils, although we do not always get all the plugs even by that procedure. A plugged bronchus gives the anaerobes a chance to grow behind the plug and they get out through the tissues. Dr. Baum made a suggestion the other day — the possibility of blood running down into the larynx even when the patient is conscious, and since blood does not irritate like saliva and other substances and is not coughed out, a clot may form on the wall and bacterial action may begin in the tissues.

Dr. Leroy A. Schall: Although this is a discussion of post-tonsillar abscesses, a number of abscesses do occur following other operations than those on the nose and throat. I therefore wish to go on record as losing a case of abscess of the lung complicating a septic sinus thrombosis. The abscess was shown by the roentgen examination thirty-six hours after ligation of the jugular vein.

Dr. Louis H. Clerf: Dr. Jones asked about finding the opening of the abscess when one does bronchoscopic aspiration. I have never observed a case in which I was able to enter the abscess cavity with the bronchoscope; the abscess cavity may be entered in certain cases with the aid of straight or curved aspirating tubes.

Regarding the question of early bronchoscopy in the treatment of patients with abscess of the lung, there are some who say that it is better to wait, that is, continue medical treatment and see whether or not the patient will get well. Frankly, I do not understand the rationale of advising delay, especially after hearing today of the remarkable results secured from early bronchoscopy by others, and observing the results in many of our cases. I believe that the earlier bronchoscopy is done the better.

Dr. Charles J. Imperatori: Limiting my remarks to the treatment, I might outline what we do at the New York Post-Graduate Hospital when we have this

type of case. We treat the patients by early bronchoscopy — the earlier in my opinion, the better for the patient. The dictum should be aeration, and more aeration, and more aeration. Frequently, bronchoscopy apparently results in nothing; that is, we see nothing, but the patient promptly gets well. I have seen that in three or four cases within the past six months.

Dr. Yankauer has done a great deal of this work. I was associated with him at Mount Sinai Hospital for a year and there I had the opportunity to observe this work as his associate and as an observer. At that institution where early bronchoscopic work is done for abscess of the lung they irrigated the abscess or bronchiectasis. Personally, I have never seen the rationale of irrigation of abscess of the lung. I have never been able to get into the abscess. I cannot conceive how the bronchoscope gets into the abscess. One gets into the neighborhood of the bronchus that leads to the abscess and with a flexible aspirator is able to get some of the secretions from the abscess. I believe that the cases that are discovered as abscess of the lung should be given at least six or eight weeks' trial by bronchoscopic and medical treatment. The treatment I give is preliminary diagnostic bronchoscopy, postural drainage and the inhalation repeatedly, at four hour intervals, of oxygen. Bacteriologically, mostly all abscesses of the lungs contain anaerobes. I have never injected oxygen directly through the bronchoscope. I use the ordinary gas-ether inhalation bag, using from two to four of these bags every four to six hours. The patient is taught how to fill the bag and how to use the inhalation. At the second bronchoscopy, if the patient has not decidedly improved and I can find where the pus is coming from, I usually instill an arsenical solution. About 30 minims (1.90 cc.) is sprayed into the bronchus, where we assume the abscess is located. Usually the offensive odor of the sputum is diminished materially, and if one is going to get results from bronchoscopic treatment they are manifest within a short time. I mean that one is able to say that one is going to get results from treatment by the cessation of the smell of the sputum, by the diminution of the amount of the sputum and by the general appearance of the patient. A high caloric diet should always be given, but the thing I want to stress is that I do not wash out the abscess.

SCIENTIFIC SESSION

THE PRESIDENT: Before we begin our regular program we will hear a further report from Dr. Harris P. Mosher on cervical exostosis.

CERVICAL EXOSTOSIS: A FURTHER REPORT. DR. HARRIS P. MOSHER, Boston.

Through the courtesy of your Chairman I am allowed this opportnity to give a follow-up report on a case which to me is historical. As far as I know, it is the first reported case of exostosis of the cervical vertebrae associated with difficulty in swallowing. Since it was reported there have been other cases observed, and in my mind, at least, this form of pathology is established as one of the causes of difficulty in swallowing.

Four years ago, a woman, then 78 years of age, came to me on account of difficulty in swallowing. She was not examined by the esophagoscope, for reasons which I will not go into, mainly, the objections of her family, and she has not been examined by this procedure since. The roentgen examination showed marked spurs of the sixth and seventh cervical vertebrae, and an old arthritic process higher in the cervical spine. She had marked arthritic swelling of the joints, but at that time only moderate difficulty in swallowing. I lost track of her after making a diagnosis, which the roentgen consultant concurred in, of difficulty in swallowing probably due to the sharp exostosis. After the patient disappeared, she was seen by almost every well known physician in the country.

She came back, after four years, a living skeleton on the edge of starvation. I can say this — it was a great scientific satisfaction to me to have the case progress in this fashion. The question was, what should I do. Every swallow resulted in marked strangling, and my thought was to do a gastrostomy. The roentgen examination showed that the spurs were of the same size as four years

previously. In addition, it showed the following new conditions: Barium given in the upright position resulted, as the taking of any liquid had resulted for a year or more, in marked strangling, so that the patient had given up going to the table. For some reason unknown to me, but through his keenness, it struck Dr. McMillin that if the patient were put on her back and given the usual barium sulphate meal something more might be learned, and to his great surprise she swallowed without strangling. The roentgen examination showed a much larger stream with the patient in the recumbent than in the upright position. I shall not go into the reason for this, if I know it, but she was relieved from much of her discomfort. She is now being fed, of course, in that position. If it does not work I see nothing else to do except a gastrostomy.

Shortly after that we performed an autopsy following a fatal case of carcinoma of the esophagus, and we found in that patient a marked exostosis of the lower thoracic vertebrae. The exostosis looked like a ring-pessary around the vertebral column. I was much interested in getting an extensive specimen. The exostosis, as seen at autopsy, was a round, smooth affair — very prominent, but round and smooth. In the patient of whom I speak the roentgen examination showed that the exostosis was sharp and needle-like and resulted in bleeding when the patient had a gastro-intestinal upset. I could not quite put the two together, but the roentgenogram of this apparently large, smooth exostosis showed the same sharp spurs. The soft material which makes the ringlike pessary — if you will allow me to continue that figure — is due to the enlargement of the anterior ligaments of the spine. I have a feeling that the patient probably has the same cushion over the cervical spurs, and I should now feel happier about trying to pass an esophageal tube than before I had this new pathologic knowledge.

THE QUESTION OF ANESTHESIA IN PERORAL ENDOSCOPY. DR. EDWIN MCGINNIS, Chicago.

Twenty years previously, the men with whom the author worked used ether anesthesia in endoscopy combined with the administration of atropine sulphate to check secretions. They experimented later with chloroform, but its use was followed by two fatalities.

Eventually, Dr. Ingals used local anesthesia in a man, aged 45, to remove a gold band crown from the upper lobe of the right bronchus which had been in situ for nine months. Although considerable traction was necessary to remove the foreign body, the patient felt no pain. Following this experiment, he used local anesthesia in adults, but with children only morphine and atropine.

Four years previously, after experiencing difficulty with interns and trained assistants, and losing two cases, the author again adopted the use of general anesthesia, the trouble with secretions being obviated by use of suction.

He cited two cases illustrating the greater ease with which he could remove foreign bodies with the patient relaxed by general anesthesia; one, a man, with a five-tooth gold bridge in the left bronchus; the other, a woman, with a piece of chicken bone in the esophagus, where emphysema was elicited in the neck previous to endoscopy.

He summed up the disadvantages of ether anesthesia as follows: 1. Excess secretion, overcome by mechanical suction. 2. In cases of small particles, such as nuts, the patient cannot be made to cough. 3. Some cyanosis when one main bronchus is partially or completely occluded by foreign body.

The advantages of complete anesthesia were: 1. Work can be done without trained assistants. 2. Complete relaxation and in bronchoscopic cases relaxation of the bronchi. 3. In children, absence of fear and shock.

DISCUSSION

DR. HARRIS P. MOSHER, Boston: In regard to the relaxation of the esophagus obtained by ether, I am very much impressed by it in connection with sharp foreign bodies in the esophagus. You do, however, get relaxation, and I am surprised how readily it occurs in bronchoscopy done as a routine measure with cocaine.

DR. SIMON JESBERG, Los Angeles: I cannot help but feel that the choice of anesthetic in endoscopic cases is of great importance. We must necessarily be governed in our choice by the age and condition of the patient. In esophageal foreign bodies, local anesthesia, with the struggling of the patient, is dangerous, and I feel that the general anesthetic is the choice in that case. However, in respiratory foreign bodies I use local anesthesia. I think that we do not use enough morphine, particularly in children. In talking it over with a prominent pediatrician, I brought up the point that we were taught that morphine is not for the young or the old, but I think that we were taught incorrectly. I recall distinctly a child 18 months of age with a bean in the bronchus, who had a collapse of the lung, and something had to be done quickly. I knew that the child had low vitality and would not stand an anesthetic, so I administered morphine 1/20 grain (0.0032 Gm.). I had to work one hour to remove the bean piecemeal as there were no spaces for forceps. We had a very close call, and I do not believe that the child would have come through without morphine. I use morphine in physiologic doses, i. e., sufficient to cause the patient to relax completely, regardless of age or the local anesthetic. I use very little cocaine, but I have used butyn since it came out and have had but one diagnostic reaction. I use sufficient to get good analgesia.

DR. LOUIS H. CLERF, Philadelphia: I am interested in the use of morphine because that is our mainstay in the Clinic in Philadelphia. We use morphine in large doses, not only for adults but for children. I have made it a rule to accept as the adult dose 1/2 grain (0.0324 Gm.) of morphine sulphate for a normal person weighing about 160 pounds (72.6 Kg.), and then to compute the dose for children on that basis. It may seem a rather large dose, but so far no ill results have been seen. We do not prescribe atropine with morphine in cases of foreign body because we believe that atropine will tend to dry up the secretions, and often there is enough difficulty without that. In adults, I like scopolamine combined with morphine, given an hour and a quarter or an hour and a half before the esophagoscopy or bronchoscopy is performed. This will give satisfactory relaxation.

DR. EUGENE R. LEWIS, Los Angeles: It happens that Dr. Baum and I were discussing the use of morphine in the case of children last night. I told him of a 2 1/2 year old child sent to me by one of our pediatricians with instructions that on account of some thymus condition neither nitrous oxide, ether, chloroform or ethylene could be used. The youngster had been ill for three or four days with what was diagnosed as diphtheria, but it was apparent that it was a case of foreign body. The foreign body turned out to be a large wild oat 1 3/4 inches long, completely embedded in the left tonsil. In that case, we gave the child 1/4 grain (0.0162 Gm.) of morphine with 1/150 grain (0.00043 Gm.) of hyoscine at one dose, and repeated it in about forty-five minutes, and while there was not complete narcosis the youngster was sufficiently relaxed to permit of easy removal of the foreign body.

An obstetrician in the family was there at the time, and seeing the effect of this narcosis he said, "I wonder if we could not use that safely for the performance of a circumcision, which has been deferred on account of the question of anesthetic." About a week later, I anesthetized the baby again, 1/4 grain of morphine and 1/150 grain of hyoscine being used, and the surgeon circumcized the child with ease. I am sure that Young's rule, while it may have been true in the last century, does not fit this.

I give children between 18 months and 3 years 1/4 grain of morphine at one dose and have had no difficulty.

DR. LYMAN RICHARDS, Boston: Like Dr. McGinnis, I shift about from ether to local anesthesia, and I have come to formulate no hard and fast rules. Occasionally, with a patient under a local anesthetic, I have failed at the first attempt to remove the foreign body, but have succeeded with the patient under ether. On the other hand, I have failed occasionally in instances in which ether was used, and in some cases in which there was cessation of breathing and alarming cyanosis, I have allowed the patient to come out from under the anesthetic and resumed

without any. My feeling is that in practically all children any bronchoscopic work should be done without a general anesthetic.

I am in favor of larger doses of morphine. The Children's Hospital in Boston has, for some reason, an almost fixed rule against what I believe adequate doses of morphine. You would be amazed at the infinitesimal doses they use, and they look with distinct horror on larger doses. But I do believe that children can stand larger doses of morphine. In esophageal cases, I believe that one gets better relaxation under general anesthesia, and with the use of relatively small sized tubes one is far less likely to cause trauma than with the patient under local anesthesia. We give practically all adults local anesthesia—a preliminary dose of morphine and scopolamine carried out with personal observation of the patient. It is difficult to tell what a patient will do after a dose of morphine and scopolamine. What will be a big dose for one will not have much influence on another. The only way is to take time enough to try it on the patient and see the effect. I have practically given up ether in adults. I still retain it for esophageal work in children.

DR. L. W. DEAN, St. Louis: Chloroform and oxygen will cause relaxation just as well as ether and will not irritate the air passages. In the absence of lesions of the brain, heart or kidney, chloroform and oxygen is the best anesthetic, provided one is sure to prepare the patient from a metabolic standpoint by the feeding of sugar, etc., so as to obviate the changes in the liver which may follow chloroform anesthesia.

Dr. McGinnis spoke of having had two deaths, one following chloroform anesthesia. When one uses chloroform for a general anesthetic one should be sure to keep in mind the pharmacologic action of chloroform and epinephrine when used at the same time. If one uses a little epinephrine on an animal and then administers chloroform, the animal will die almost instantly, and the same is true of the human being. We should not use chloroform and epinephrine together.

DR. HARRY L. BAUM, Denver: I have nothing particularly new to add to the discussion of the paper, but in my own practice for a good many years it has been the rule never to use general anesthesia except in cases of intractable patients and in cases of sharp, impacted foreign bodies in the esophagus. In children, ether is seldom necessary even with sharp foreign bodies in the esophagus. In my own experience, open safety-pins in children are usually removed without anesthesia. In adults, I use no anesthesia except preliminary morphine and hyoscine. I learned that many years ago from Dr. Eugene R. Lewis, and have continued to practice it with uniform satisfaction. I give my adult patients, for both bronchoscopy and esophagoscopy — with the exception of sharp impacted foreign bodies in the esophagus — a preliminary dose of morphine and hyoscine. This results in the relaxation and freedom from dread, which are so essential in these cases. I usually give these patients only the preliminary hypodermic the first time if repeated bronchoscopy is necessary. After the first bronchoscopy in adults, it is not necessary to give further doses of morphine and hyoscine. They have had the experience, they are more or less trained and one can proceed without anesthesia. There is one exception, and that it when there is a violent cough I use a very weak cocaine solution in the trachea. Usually a 1 per cent solution abolishes the cough reflex nearly as quickly as 10 per cent, and it is safer. Dr. McGinnis made one statement that does not agree with my experience, to the effect that he had freedom from cough under general anesthesia. I have found in the few intractable cases in which I have used ether narcosis that the cough still persisted even with complete narcosis. In those cases I have used sparingly a 1 per cent solution of cocaine, and I have been struck with the simplicity of the method and the results secured. It is not original, of course, but I find it practical.

I have another use for cocaine that is similar and also satisfactory. In doing laryngeal operations, either by the direct method or by suspension, in patients who require general anesthesia, I have found that under the anesthesia the cords do not relax, and here also I use this same method. After the patient is anesthetized, before proceeding with operative intervention, I touch the cords with a weak

solution of cocaine, wait a minute, possibly reapply and perhaps reapply two or three times during the course of the operation. This enables me to proceed with satisfactory relaxation of the cords. I feel that it is entirely safe because of the small amount of the weak solution of cocaine used, and it facilitates intralaryngeal manipulation under ether.

DR. EDWIN MCGINNIS: About a week before I came west I had a letter from Dr. Emil Mayer, in which he said that in all the cases he had been able to find, and from the patients who had been sent to him as chairman of the committee on accidents following the use of local anesthesia, the trachea, bronchi and air cells would stand more cocaine than any other part of the anatomy.

I brought this subject before the society because I have been interested in what anesthetic to use in patients on whom I had to operate for the removal of foreign body or for laryngeal tumor. I have taken coins out of the esophagus without any anesthetic, and will continue to do so. I had a case a couple of weeks ago, in which a piece of peanut shell lodged in the larynx, which I removed without an anesthetic.

I have learned enough about ether anesthesia to realize that it has a certain, definite place. I do not worry about a patient getting worse under ether. Occasionally, the anesthetist gets worried, but as soon as we aspirate the excess secretion the patient improves and we have no difficulty.

I am glad that this paper brought out some discussion. I think that we know better where we stand. I am not going to give up general anesthesia, because, as Dr. Mosher brought out, in cases of sharp-angled bodies it is better to have complete relaxation. Dr. Tucker showed a tube for pushing a safety-pin down into the stomach and pulling it out through the tube. In that type of case, I should not be in favor of giving up the use of general anesthesia.

MIXED TUMOR OF THE PAROTID TYPE GROWING FROM THE POSTERIOR ASPECT OF THE THYROID CARTILAGE: REPORT OF A CASE. DR. ROBERT C. LYNCH, New Orleans.

This article will be published in full in the March issue of the ARCHIVES.

PERITRACHEAL ABSCESS. DR. LYMAN RICHARDS, Boston.

This article will be published in full in the March issue of the ARCHIVES.

DISCUSSION

DR. EDWIN MCGINNIS, Chicago: I had one case similar to that of Dr. Richards — a patient with dyspnea, with an acute rise in temperature. We first did an intubation, but in a day or two decided to do a tracheotomy, with the same experience as Dr. Richards'. Evacuation of pus occurred as soon as we cut down to the cartilage.

DR. LYMAN RICHARDS: I want only to mention two points. First, we thought until we actually did the operation that we were dealing with a superficial laryngeal obstruction. Second, the presence of this apparent collection of fluid left some doubt as to whether or not the patient should be operated on. I think that it would have been disastrous if the patient had been operated on by thyrocotomy, but at that time there was great uncertainty as to the nature of the roentgen shadow. One object I had in presenting the case was to show the complexity introduced by the roentgen observations.

CHANGES IN THE ESOPHAGUS SECONDARY TO CARDIAC AND AORTIC DISEASES. DR. LEO G. RIGLER and DR. KENNETH A. PHELPS, Minneapolis (by invitation).

This article appears in full in this issue, p. 188.

DISKS IN THE ESOPHAGUS: ANALYSIS OF FORTY-FIVE CASES. DR. SIMON JESBERG, Los Angeles.

This article appears in full in this issue, p. 210.

DISCUSSION

DR. LOUIS H. CLERF, Philadelphia: This excellent paper recalls the case of a patient who came to the Bronchoscopic Clinic about two years ago, a boy 10 years of age, who was said to have a fifty cent piece in his esophagus. There was no question about it because the roentgen study revealed a large disk at the junction of the middle and lower thirds.

The history was that at the age of 5 the patient, now 10, was supposed to have swallowed a fifty cent piece. Unfortunately for the patient, the parents were advised to wait; also unfortunately, the roentgen study that was made apparently did not include the cervical esophagus. I am sure that the coin was in the cervical esophagus at that time. Nothing was done; the child continued to have difficulty in swallowing, and about a month before he was sent to us he developed symptoms referable to the respiratory tract. Dr. Manges, who made the roentgen studies when the child was admitted, suspected an esophagobronchial fistula, and gave the child a barium mixture to swallow; the material went into the left bronchus as well as into the stomach, undoubtedly a fistula. It is also interesting to note that the patient had an empyema that had been drained and was still discharging. At the same time, there was a large inflammatory mass in the left lower part of the back. The child developed an acute respiratory infection and died. At the postmortem examination an opening was found in the esophagus which communicated with the left bronchus. It was about 2 by 1.5 cm.; epithelization had taken place, and the coin, with a notch in its edge, corresponded to the fistula so that the edge of the coin could be seen from the left bronchus. A properly made roentgen study would have revealed the coin when it was swallowed five years previously.

DR. CHARLES W. BROWN, San Diego, Calif.: I have seen about twenty cases of disks, two of the kind Dr. Jesberg speaks of and one with sharp edges, but I have never had one in the esophagus; they always lodged in the pharynx just above the cricopharyngeus. This might be due to the advice of the pediatricians in our town, who encourage the mothers to bring the children to us at once when a coin has been swallowed.

DR. EDWIN MCGINNIS, Chicago: I have had three cases simulating some of those that Dr. Jesberg presented. The first patient was a youngster, 3 years of age, in northern Michigan, who had had a quarter in the esophagus for about twenty weeks. This child had been taken to a physician in the town who had some x-ray pictures taken, which were not very good, and the removal of the coin had been neglected. About this time, I happened to get my name in the *Chicago Tribune* and three or four days later I got a letter from the mother of this youngster saying that she was sure her baby had a coin in the esophagus but she could not get any one there to listen to her. I wrote her to bring the child to Chicago, where we had x-ray pictures taken which showed the quarter just above the cardia. We were able to loosen the coin on two sides where it had become embedded in the wall and removed it. Previous to removal of the coin, the child could be heard coughing all over the ward, but a few days after the removal the cough disappeared.

I saw another patient about two months ago who showed a disk in the x-ray picture at the sternoclavicular notch, but when we examined the youngster with the esophagoscope there was no coin, and when we examined the trachea, there was no coin. We took the child to the fluoroscopic room and since the disk was still there, took lateral pictures and decided that it was embedded in the wall between the esophagus and the trachea.

The last case I saw six weeks ago when a good surgeon showed me an x-ray picture of an Italian child, aged 2½ years, with a disk at the usual site in the esophagus. He said that within a week three people had anesthetized the child on three occasions and worked an hour and a half, but that the coin was still in the esophagus. On examining the child, I was surprised to find two or three holes in the posterior pharyngeal wall extending between the esophagus and the spinal column. It was easy to see the coin after I lifted up the esophagus and

though it was buried in the anterior wall it was easily removed with suitable forceps. The child lived only six or eight hours after the removal. It was a case of fatality due to ill advised attempts at removal.

DR. LYMAN G. RICHARDS, Boston: In some of these cases, I find two elements: First, the tendency of the foreign body to hide in the posterior folds of the esophagus. It is not unusual to overlook them and hunt a considerable length of time before they are found. I have seen fatalities result from overzealous search for a coin which showed in the x-ray picture but was simply hidden in the posterior folds of the esophagus.

Second, I have been disappointed once or twice in looking for a coin which showed in the x-ray picture, due to failure to have fluoroscopy performed on the patient immediately before the operation. These coins will show in the esophagus at one time, and in twenty-four hours you cannot find them. I think that it is important to perform fluoroscopy on all these patients a short time before operation.

DR. CHARLES J. IMPERATORI: I am glad to hear Dr. Richards recommend fluoroscopy previous to esophagoscopy. I have established a routine procedure that no patient shall go to the operating room — no patient with a disk or foreign body in the esophagus — without fluoroscopy, even though a roentgenogram was taken a few hours before.

I should like to ask Dr. Law if he could help us as to the localization of these foreign bodies, particularly when they are found in the outer wall.

DR. FREDERICK M. LAW, New York: I think that these cases illustrate what I said yesterday — do not accept a poor or fairly good roentgenographic plate. Consider the roentgenologist as your assistant, but do not accept an inferior picture when it involves a question of surgical intervention. In one particular case mentioned here, the quality of the film was more important than the problem of treatment. The failure to locate the foreign body contributed to the death of the child. There is no reason why that disk should not have shown. A plate or film of a metallic substance in the neck that does not show the spinal column is of no use. If it is a nonopaque body it is different, but in this particular case the film did not show the spinal column; therefore, the disk did not show.

So far as locating the position of the foreign body is concerned, the fluoroscope is best. The steroscopic roentgenogram is next. A combination of the two is really essential, but the location should be checked up by the fluoroscope just before an attempt at removal. It is a difficult problem and requires careful teamwork between the roentgenologist and the bronchoscopist. That is the only way for satisfactory localization.

DR. SIMON JESBERG: Dr. Richards asked how I arrived at the conclusion that the disk was first in the esophagus and only recently penetrated into the trachea. A foreign body could not remain in the respiratory tract such a length of time without more respiratory symptoms. Examination of the tissues at autopsy, a photograph of which is shown in the slide, showed that a smooth epithelium-lined pouch is present in the esophageal wall. The slit where recent entrance to the trachea was established as well as the tracheal walls have granulations. This indicates that the disk was first in the esophagus and later in the trachea.

Directory of Otolaryngologic and Ophthalmologic Societies *

NATIONAL

American Medical Association, Section on Laryngology, Otology and Rhinology

Chairman: Dr. Robert C. Lynch, Maison Blanche Bldg., New Orleans, La.
Secretary: Dr. Gabriel Tucker, Bronchoscopic Clinic, University Hospital, Philadelphia.
Place: Detroit. Time: June 23-27, 1930.

American Bronchoscopic Society

President: Dr. Thomas E. Carmody, Metropolitan Bldg., Denver.
Secretary-Treasurer: Dr. Louis H. Clerf, 128 S. 10th St., Philadelphia
Place: Atlantic City, N. J. Time: May 27, 1930.

American Laryngological Association

President: Dr. Lewis A. Coffin, 114 E. 54th St., New York.
Secretary: Dr. George M. Coates, 1721 Pine St., Philadelphia.
Place: Swampscott, Mass. Time: May 22-24, 1930.

American Laryngological, Rhinological and Otological Society

President: Dr. Ross Hall Skillern, 1811 Spruce St., Philadelphia.
Secretary: Dr. R. L. Loughran, 33 E. 63d St., New York.
Place: Atlantic City, N. J. Time: May 28-30, 1930.

American Otological Society

President: Dr. S. MacCuen Smith, 1429 Spruce St., Philadelphia.
Secretary: Dr. Thomas J. Harris, 104 E. 40th St., New York.

American Academy of Ophthalmology and Oto-Laryngology

President: Dr. William H. Wilder, 122 S. Michigan Ave., Chicago.
President-Elect: Dr. J. F. Barnhill, Miami Beach, Fla.
Executive Secretary: Dr. William P. Wherry, Medical Arts Bldg., Omaha.
Place: Chicago. Time: October, 1930.

SECTIONAL

Academy of Medicine of Northern New Jersey, Section on Eye, Ear, Nose and Throat

Chairman: Dr. Frederick J. Wort, 1080 Broad St., Newark.
Secretary: Dr. Earl LeRoy Wood, 31 Lincoln Park, Newark.
Place: 91 Lincoln Park South. Time: 8:45 p. m., second Monday of each month.

Eastern New York Eye, Ear, Nose and Throat Association

President: Dr. John P. O'Keefe, 251 State St., Albany.
Secretary-Treasurer: Dr. Arthur F. Holding, 142 Washington Ave., Albany.
Time: Third Wednesday of October, November, March, April, May and June.

* Secretaries of societies are requested to furnish the information necessary to make this list complete and to keep it up to date.

NEW ENGLAND OTOLOGICAL AND LARYNGOLOGICAL SOCIETY

President: Dr. Harris P. Mosher, 828 Beacon St., Boston.
Secretary-Treasurer: Dr. Charles T. Porter, 520 Commonwealth Ave., Boston.

PACIFIC COAST OTO-OPHTHALMOLOGICAL SOCIETY

President: Dr. Arthur C. Jones, 105 N. 8th St., Boise, Idaho.
Secretary-Treasurer: Dr. Walter F. Hoffman, 817 Summit Ave., Seattle.

PUGET SOUND ACADEMY OF OPHTHALMOLOGY AND OTO-LARYNGOLOGY

President: Dr. Will Otto Bell, Medical-Dental Bldg., Seattle.
Secretary-Treasurer: Dr. Francis A. Brugman, Medical-Dental Bldg., Seattle.
Time: 8 p. m., third Tuesday of each month, except July and August.

SOUTHERN MEDICAL ASSOCIATION, SECTION ON EYE, EAR, NOSE AND THROAT

Chairman: Dr. Fred Hasty, 119 Seventh Ave., Nashville, Tenn.
Secretary: Dr. Fletcher D. Woodward, Box 162, University, Va.
Place: Louisville, Ky. Time: November, 1930.

STATE

COLORADO OTO-LARYNGOLOGICAL SOCIETY

President: Dr. Frank L. Dennis, Ferguson Bldg., Colorado Springs.
Secretary: Dr. Rex L. Murphy, Metropolitan Bldg., Denver.
Place: Assembly Room of Metropolitan Bldg., Time: First Saturday of each month from October to May.

EYE, EAR, NOSE AND THROAT CLUB OF GEORGIA

President: Dr. George B. Smith, Rome.
Secretary-Treasurer: Dr. William O. Martin, Jr., 384 Peachtree St., Atlanta.

INDIANA ACADEMY OF OPHTHALMOLOGY AND OTO-LARYNGOLOGY

President: Dr. H. A. Van Osdol, 320 N. Meridian St., Indianapolis.
Secretary: Dr. Robert J. Masters, 23 E. Ohio St., Indianapolis.
Place: Indianapolis. Time: December 10 and 11, 1930.

MINNESOTA ACADEMY OF OPHTHALMOLOGY AND OTO-LARYNGOLOGY

President: Dr. C. N. Spratt, 900 Nicollet Ave., Minneapolis.
Secretary-Treasurer: Dr. J. H. Morse, 80 S. 7th St., Minneapolis.

MONTANA ACADEMY OF OTO-OPHTHALMOLOGY

President: Dr. Lee W. Smith, 125 W. Granite St., Butte.
Secretary: Dr. J. G. Parsons, Lewistown.
Time: Semi-annually.

NORTH DAKOTA ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

President: Dr. George M. Constans, Bismarck.
Secretary-Treasurer: Dr. F. L. Wicks, Valley City.

OREGON ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

President: Dr. J. W. McCollom, 346½ Washington St., Portland, Ore.
Secretary: Dr. Andrew J. Browning, 418 Mayer Bldg., Portland, Ore.
Place: Good Samaritan Hospital. Time: Third Tuesday of each month.

Rhode Island Ophthalmological and Otological Society

President: Dr. J. E. Raia, 272 Broadway, Providence.
Secretary: Dr. F. W. Dimmitt, Jr., 195 Thayer St., Providence.
Place: Rhode Island Medical Library. Time: 8:30 p. m., second Thursday in October, December, February and April.

Utah Ophthalmological Society

President: Dr. F. M. McHugh, 17 Exchange Pl., Salt Lake City.
Secretary-Treasurer: Dr. W. Leroy Smith, Ezra Thompson Bldg., Salt Lake City.

Virginia Society of Otolaryngology and Ophthalmology

President: Dr. H. B. Stone, 303 First St., Roanoke.
Secretary-Treasurer: Dr. Fletcher D. Woodward, Box 162, University.

LOCAL

Atlanta Academy of Ophthalmology and Otolaryngology

President: Dr. Leon E. Brawner, 157 Forrest Ave., Atlanta.
Secretary: Dr. William O. Martin, Jr., 384 Peachtree St., Atlanta.
Place: Academy of Medicine, 38 Prescott St. N. E. Time: 8 p. m., last Thursday of each month.

Baltimore City Medical Society, Section on Otology and Laryngology

Chairman: Dr. Waitman F. Zinn, Medical Arts Bldg., Baltimore.
Secretary: Dr. Moses L. Breitstein, 1212 Eutaw Pl., Baltimore.
Place: 1211 Cathedral St. Time: 8:30 p. m., last Friday of each month.

Chicago Laryngological and Otological Society

President: Dr. Samuel Salinger, 25 E. Washington St., Chicago.
Secretary-Treasurer: Dr. Austin A. Hayden, 25 E. Washington St., Chicago.
Place: Medical and Dental Arts Bldg., 185 N. Wabash Ave. Time: 6 p. m., first Monday of each month from October to May.

Cincinnati Oto-Laryngological Society

President: Dr. Harris H. Vail, 24 E. 8th St., Cincinnati.
President-Elect: Dr. Edward King, Pearl Market Bank Bldg., Cincinnati.
Secretary-Treasurer: Dr. Donald Lyle, 19 W. 7th St., Cincinnati.
Place: University Club. Time: 6:45 p. m., second Tuesday of each month from October to May.

Cleveland Academy of Medicine, Section of Ophthalmology and Otolaryngology

Chairman: Dr. M. Paul Motto, Rose Bldg., Cleveland.
Secretary: Dr. A. D. Ruedemans, Euclid and E. 93d St., Cleveland.
Place: Winton Hotel. Time: Fourth Friday of each month.

College of Physicians of Philadelphia, Section on Otolaryngology

Chairman: Dr. George M. Coates, 1721 Pine St., Philadelphia.
Clerk: Dr. Frederic M. Strouse, 1301 Spruce St., Philadelphia.
Place: College of Physicians. Time: 8:30 p. m., third Wednesday of each month from October to June.

Dallas Academy of Ophthalmology and Otolaryngology

President: Dr. D. L. Bettison, Medical Arts Bldg., Dallas, Texas.
Executive Secretary: Dr. W. Mood Knowles, Medical Arts Bldg., Dallas, Texas.
Recording Secretary: Dr. L. A. Nelson, 4105 Live Oak, Dallas, Texas.
Place: Dallas Athletic Club. Time: 6 p. m., first Tuesday of each month from October to June. The November, January and March meetings are devoted to clinical work.

Detroit Oto-Laryngological Society

President: Dr. C. C. McClelland, David Whitney Bldg., Detroit.
Secretary-Treasurer: Dr. Don A. Cohoe, 13535 Woodward Ave., Detroit.
Place: Maccabees Bldg. Time: Third Wednesday evening of each month from October to May.

Fort Worth Eye, Ear, Nose and Throat Society

President: Dr. W. R. Thompson, 510 Main St., Fort Worth, Texas.
Secretary-Treasurer: Dr. R. H. Needham, Fort Worth National Bank Bldg., Fort Worth, Texas.
Place: University Club. Time: 6:30 p. m., first Friday of each month except July and August.

Houston Academy of Medicine, Eye, Ear, Nose and Throat Section

President: Dr. John H. Foster, 1300 Walker Ave., Houston, Texas.
Secretary: Dr. Edward W. Griffey, Houston Clinic, Houston, Texas.
Place: Medical Arts Bldg., Harris County Medical Society Rooms. Time: 8 p. m., first Thursday of each month from September to June.

Indianapolis Ophthalmological and Oto-Laryngological Society

President: Dr. Robert J. Masters, Hume-Mansur Bldg., Indianapolis.
Secretary: Dr. Kenneth L. Craft, Hume-Mansur Bldg., Indianapolis.
Place: University Club. Time: 6:30 p. m., second Thursday of each month from October to May.

Kansas City Society of Ophthalmology and Otolaryngology

President: Dr. L. R. Forgrave, Logan Bldg., St. Joseph, Mo.
Secretary: Dr. A. E. Eubank, Argyle Bldg., Kansas City, Mo.
Time: Third Thursday of each month from September to May. The November, January and March meetings are devoted to clinical work.

Los Angeles County Medical Society, Section of Ophthalmology and Otolaryngology

President: Dr. A. Ray Irvine, 727 W. 7th St., Los Angeles.
Secretary-Treasurer: Dr. J. Frank Friesen, 727 W. 7th St., Los Angeles.
Place: California Hospital, assembly room. Time: 8 p. m., first Monday of each month.

Medical Society of the District of Columbia, Section on Ophthalmology and Oto-Laryngology

Chairman: Dr. Louis S. Greene, 1710 Rhode Island Ave. N. W., Washington.
Secretary: Dr. E. R. Gookin, Medical Science Bldg., Washington.
Place: 1718 M St. N. W. Time: 8 p. m., third Friday of each month.

The Memphis Society of Ophthalmology and Oto-Laryngology

Chairman: Each member, in alphabetical order.
Secretary: Dr. R. O. Rychener, Exchange Bldg., Memphis, Tenn.
Place: Eye Clinic of Memphis Eye, Ear, Nose and Throat Hospital. Time: 8 p. m., second Tuesday of each month.

The Milwaukee Oto-Ophthalmic Society

President: Edward R. Ryan, 425 E. Water St., Milwaukee.
Secretary-Treasurer: Dr. O. P. Schoofs, 120 E. Wisconsin Ave., Milwaukee.
Place: University Club. Time: 6:30 p. m., third Tuesday of each month.

Nashville Academy of Ophthalmology and Otolaryngology

Chairman: Dr. R. J. Warner, 706 Church St., Nashville.
Secretary-Treasurer: Dr. W. W. Wilkerson, Jr., Bennie-Dillon Bldg., Nashville, Tenn.
Place: St. Thomas Hospital. Time: 8 p. m., third Monday of each month.

New Orleans Ophthalmological and Otological Society

President: Dr. William A. Wagner, Pere Marquette Bldg., New Orleans.
Secretary-Treasurer: Dr. M. F. Meyer, Canal Bank Bldg., New Orleans.
Place: Eye, Ear, Nose and Throat Hospital. Time: January to June and October to January—third Thursday of each month.

New York Academy of Medicine, Section of Laryngology and Rhinology

Chairman: Dr. Mervin C. Myerson, 12 E. 86th St., New York.
Secretary: Dr. John M. Loré, 240 West End Ave., New York.
Place: 103d St. and 5th Ave. Time: 8:30 p. m., fourth Wednesday of each month from October to May.

New York Academy of Medicine, Section of Otology

Chairman: Dr. Clarence H. Smith, 2 E. 54th St., New York.
Secretary: Dr. James Garfield Dwyer, 57 W. 57th St., New York.
Place: 103d St. and 5th Ave. Time: Second Friday of each month from October to May.

Omaha and Council Bluffs Ophthalmological and Otolaryngological Society

President: Dr. Charles M. Swab, Medical Arts Bldg., Omaha.
Secretary-Treasurer: Dr. J. C. Davis, 1615 Howard St., Omaha.
Place: Medical Arts Tea Room. Time: 5:15 and 7 p. m., third Wednesday of each month from October to May.

Philadelphia Laryngological Society

President: Dr. Henry A. Laessle, 13th and Spruce Sts., Philadelphia.
Secretary: Dr. Herman B. Cohen, 13th and Spruce Sts., Philadelphia.
Place: College of Physicians. Time: 8:30 p. m., first Tuesday of each month from October to June.

Pittsburgh Otological Society

Chairman: Dr. John R. Simpson, 115 South Highland Ave., Pittsburgh.
Secretary-Treasurer: Dr. Watson Marshall, 121 University Place, Pittsburgh.

Rochester Eye, Ear, Nose and Throat Society

Chairman: Dr. A. Vincent Walker, 833 South Ave., Rochester, N. Y.
Secretary-Treasurer: Dr. John F. Gipner, 53 Fitzhugh St., Rochester, N. Y.
Place: Rochester Medical Association, 13 Prince St. Time: 8 p. m., third Monday of each month from October to May.

St. Louis Ear, Nose and Throat Club

Acting President: Senior member of the executive committee: Dr. F. C. Simon, Arcade Bldg., St. Louis, Mo.
Secretary: Dr. M. L. Hanson, Murphy Bldg., East St. Louis, Ill.
Place: University Club Bldg. Time: Third Wednesday in February, April, October and December.

San Antonio Ophthalmolo-Oto-Laryngological Society

President: Dr. F. W. Sorrell, Gibbs Bldg., San Antonio, Texas.
Secretary-Treasurer: Dr. A. F. Clark, 728 Main Street, San Antonio, Texas.
Place: Bexar County Medical Library. Time: 8 p. m., first Tuesday of each month from October to May.

Spokane Academy of Ophthalmology and Otolaryngology

President: Dr. O. M. Rott, Paulsen Bldg., Spokane, Wash.
Secretary: Dr. C. A. Veasey, Jr., 421 Riverside Ave., Spokane, Wash.

Syracuse Eye, Ear, Nose and Throat Society

President: Dr. George H. Rockwell, Physicians Bldg., Syracuse, N. Y.
Secretary-Treasurer: Dr. A. Harry Rubenstein, Medical Arts Bldg., Syracuse, N. Y.
Place: University Club. Time: Second Friday of each month except June, July and August.

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